ADOBE CREEK UPPER REACH 5 RESTORATION PROJECT

West Edith Avenue to 1100 Feet Downstream

FINAL ENGINEER'S REPORT

LY 2007

Santa Clara Valley
Water District

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ADOBE CREEK UPPER REACH 5 RESTORATION PROJECT

Project No. 10104011

ENGINEER'S REPORT

Prepared by Staff of the Capital Program Services Division:

Tony Ndah, P.E., Associate Civil Engineer
Christy Chung, Assistant Civil Engineer

Under the Direction of:

Saeid Hosseini, P.E.
Senior Project Manager
Capital Program Services Division

Dave Chesterman
Deputy Operating Officer
Capital Program Services

Katherine Oven
Assistant Operating Officer
Capital Program Services Division

Nai Hsueh
Chief Operating Officer – Capital
Capital Program Services

Stanley M. Williams
Chief Executive Officer

The Engineer's Report has been prepared under the direct supervision of the undersigned who hereby certifies that he is a Registered Civil Engineer in the State of California

SAEID S. HOSSEINI
C 50920
EXP. 9/30/07
CIVIL

JULY 2007

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Larry Wilson	**District 4**		

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This document was prepared with assistance from:

Kristen O'Kane
Bobby Tan
Lee Ellis
Tamra Zozaya
Bassam Kassab
Liang Xu
Emily Zedler
Dipankar Sen
Wendy Chang
Nahm Lee
Eric Tsou
Minh-Tri Nguyen
Bill Shadel
Mike Suto
Joel Jenkins

Adobe Creek Upper Reach 5 Project

Final Engineer's Report

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Adobe Creek Upper Reach 5 Project

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Chapter 1. Summary

1.1 PURPOSE OF THIS REPORT

In May 1999, staff prepared the Adobe Creek Watershed Planning Study, containing an Engineer's Report and Final Environmental Impact Report. On June 15, 1999, the Board certified the Adobe Creek Environmental Impact Report (EIR) and adopted a resolution "approving general construction plans in the Engineer's Report and determining to proceed with work of providing flood control protection measures on Adobe Creek from El Camino Real to upstream of Moody Road."

The purpose of this report is to present changes to the approved project in the 1999 Engineer's report for the Adobe Creek Reach 5 project. This report describes the project formulation process to allow the Board to make a decision on adopting the changes to the 1999 Adobe Creek Reach 5 approved project. The Report includes:

- Problem definition (Chapter 2);
- Project objectives and criteria for formulation and evaluation of alternatives (Chapter 3);
- Development of alternatives (Chapter 4);
- Description of the preferred project alternative(Chapter 5);
- Project cost, financing, and schedule (Chapter 6);
- Conclusions and Recommendations (Chapter 7);
- References

The District is the lead agency for the purposes of California Environmental Quality Act (CEQA). A Supplemental Environmental Impact Report (SEIR) is being prepared to supplement the May 1999 Final Environmental Impact Report for the Adobe Creek Watershed Planning Study. The SEIR will address potential environmental impacts associated with changes to the Reach 5 project as shown in the May 1999 Final Environmental Impact Report.

1.2 PROJECT BACKGROUND

As described in the 1999 Planning Study, the Adobe Creek Reach 5 channel improvements consisted of: a wider channel from approximately 10-foot wide existing channel to an approximate 90-foot top width to convey the 1 percent flow. Gabions would line the City of Los Altos side of the creek to protect mature redwoods. Other modifications included a 10-foot wide low flow channel, a 10-foot wide vegetated mid-bank bench, and a 48- to 64-foot wide high flow bench. The mid-bank and high-flow benches were vegetated, but limited to groundcover and small shrubs to maintain high-flow functionality. The total length of the multi-level channel improvements proposed is approximately 700 lineal feet downstream of the West Edith Avenue Bridge. For an additional 200 feet downstream of the 90-foot wide channel, the existing channel is widened from about a 10-foot width to a 20-foot width, with vertical rock gabions comprising the channel banks.

This design for Adobe Creek Reach 5, completed in 2002, was intended to provide for one-percent flood protection in the creek from the West Edith Avenue Bridge to approximately 1,100 feet downstream. Construction of this stretch of creek required a certain acreage of mitigation planting, which the District proposed to install partly along the creek and partly in Edith Park, located just upstream of the West Edith Avenue Bridge.

There was significant community opposition to the proposed creek design and also to the proposed use of Edith Park for the mitigation planting. In April 2003, the Los Altos Hills Town Council voted to not grant the District two of the necessary easements to construct the project and install the mitigation planting for Adobe Creek Reach 5.

In the latter part of 2003, the District agreed to support a local community effort to obtain a state grant to develop an improvement plan for Adobe Creek Upper Reach 5 that would be acceptable to the community. This effort was led by the Adobe Creek Watershed Group (ACWG), comprised of creekside property owners and other members of the community. The ACWG did not obtain the grant.

In September 2003, the District, in partnership with local municipalities and the ACWG, initiated a collaborative effort to revisit the goals and objectives of providing flood and erosion protection for Reach 5 of Adobe Creek. This collaborative effort (Collaborative) included District staff, ACWG members, other creekside residents and citizens, and staff from the City of Los Altos, the Town of Los Altos Hills, and various regulatory agencies. By December 2003, a conceptual approach for meeting the Collaborative's objectives for creek channel improvements in this reach was attained.

On April 20, 2004, the District Board of Directors was informed that a Project Plan for the Adobe Creek Reach 5 Restoration Project had been prepared by the District and the Collaborative. In addition, a Collaborative Principles document (SCVWD 2004) was prepared and signed by 51 persons including members of the ACWG, District staff, the Town of Los Altos Hills, the City of Los Altos, and three regulatory agencies, and is contained in the Project Plan. The Collaborative Principles document spells out the responsibilities of all Collaborative members for the purposes of planning, designing, constructing and maintaining the Adobe Creek Reach 5 Project.

1.3 PREFERRED PROJECT ALTERNATIVE DESCRIPTION

The alternatives developed for the project were evaluated by the Collaborative. The preferred alternative was identified through the Collaborative process, with decisions aimed at balancing the needs of all Collaborative members. Regulatory agencies, as members of the Collaborative, have provided support for the planning and the conceptual design of the alternatives developed, though the regulatory agencies can not formally approve of the project prior to an application for permits.

The preferred alternative consists of a modified natural geomorphic channel with a limited channel top width for 500 feet downstream of West Edith Avenue and a geomorphic channel with "fish passable" step pools for the following 200 feet, ending at the Robleda storm drain outlet. For 400 feet downstream of the Robleda storm drain outlet, the preferred alternative consists of stabilizing the channel invert with "fish passable" step pools along the channel bottom, placing rock from the channel toe to 3 feet up the bank, placing rock rip-rap slope protection at eroded channel banks up to the ten-percent water surface elevation, and reinforcing the existing cutoff walls at the toe of existing sacked concrete slope protection.

The Collaborative agreed on a channel capacity criterion of 1,100 cfs (close to a ten-percent event as per District Hydrology) for the channel from West Edith Avenue downstream to the Robleda Storm Drain outlet. The channel capacity increases to the 100-year capacity as the channel deepens downstream of West Edith Avenue. This channel capacity is based on a stable channel configuration within the right of way limits provided by the creekside residents.

The preferred alternative that has evolved through the Collaborative process is markedly improved from the 1999 preferred alternative. Highlights of the changes include:

- The proposed width of the improved channel varies from 40-50 feet instead of the 90-foot top width of the 1999 preferred alternative, thus yielding a much smaller footprint on properties adjacent to the creek.
- No rock gabions will be used in any section of the modified creek. The preferred alternative will reduce the amount of hardscape along channel banks.
- A natural channel will be installed for the first 500 feet of the channel downstream of West Edith Avenue Bridge that will include an earthen bottom (no rock rip rap) in a geomorphically-derived bankfull (low-flow) channel, and a vegetated bench on either side.
- Step-pools will be installed for the remaining 400 feet of channel improvements to accommodate the creek's steep slope in a manner that will maintain the stability of the first 500 feet of channel but still allow for fish passage. Instead of gabion structures on either bank of the last 200 feet of the project, rock slope protection will be provided only up to the ten-percent water surface elevation. Most existing bank slope protection will remain in place and natural bank areas will be revegetated to reduce erosion potential.
- Due to the smaller project footprint, fewer trees will be removed for the preferred alternative

The preferred alternative requires permanent easements from creekside residents and temporary construction easements for site access and staging. All permanent easements for the project have been granted by the property owners.

The estimated construction cost for this Project is $2.5 million (2006 dollars). The Project will be funded by the Lower Peninsula Watershed Fund.

1.4 PUBLIC OUTREACH

The monthly Collaborative meetings, as well as numerous steering committee meetings (the steering committee is comprised of the primary stakeholders of the ACWG) with District staff have been the means of ongoing public outreach for the project. Since September 2003, collaborative meetings have been held almost monthly and involve creekside residents, concerned citizens, and staff from the Town of Los Altos Hills, City of Los Altos, regulatory agencies, and the District. These meetings have provided a forum to identify issues and concerns, develop project objectives, present alternatives, and identify the preferred alternative for the project.

The Adobe Creek Watershed Group established a website for the Project for informational purposes at http://www.lahopenspace.com/Adobe5. This website contains a description of the project, photographs, minutes of Collaborative meetings, schedules, residents' inputs, District reports, and documents the history of the development of the project.

A public hearing on this Engineer's Report will be held and comments will be solicited from the community and responsible agencies. The District Board of Directors will subsequently decide whether to proceed with the preferred project.

Chapter 2. Problem Definition

2.1 PROJECT LOCATION AND SETTING

Adobe Creek is located in the northwestern portion of Santa Clara County and lies within the District's Lower Peninsula Watershed. Adobe Creek forms the boundary between the City of Los Altos (on the east bank) and the Town of Los Altos Hills (on the west bank).

Adobe Creek Upper Reach 5 is located between Foothill Expressway and West Edith Avenue as shown in Figure 2-1. The creek flows from south to north in this figure. The extent of the proposed project work begins at West Edith Avenue and continues downstream for approximately 1,100 feet.

2.2 HISTORY OF FLOODING

Adobe Creek has a history of flooding and erosion which adversely affects the safety and security of the residents in the floodplain. In 1952 (see Photo 1) and 1955, flooding occurred near West Edith Avenue. The storm of 1955 caused losses from flooding and flood-related damages in the vicinity of Adobe Creek of $86,800 (all losses are based on 1955 dollars): $15,000 for agricultural, $70,900 for residential, and $900 for nonresidential damages. The major portion of damage to residential property was attributed to bank erosion. During the 1980s, flooding occurred in 1980, 1982, twice in 1983 (see Photo 2), and 1986 (see Photo 3). During the 1990s, flooding occurred in 1993 (see Photo 4), 1995 (see Photo 5), and 1998. During the January 9–10, 1995 storm, the Robleda Drain, a tributary of Adobe Creek which enters Adobe Creek approximately 700 feet downstream of West Edith Avenue, flooded when it became blocked with debris. The floodwaters flowed through two houses, over Fremont Road, and spread over two acres of property adjacent to Adobe Creek. Overbanking from Adobe Creek downstream of West Edith Avenue added to the property flooding from the Robleda Drain. This flooding and the high creek waters in Adobe Creek caused approximately 100 feet of wooden retaining wall adjacent to the creek to fail during the storm. During the same January 1995 storm, floodwaters overbanked at several locations on Adobe Creek upstream of the project area, including at the Redwood Grove Park, Shoup Park, and upstream and downstream of Burke Road.

On February 2 and 3, 1998, floodwaters overbanked from 500 feet downstream of West Edith Avenue to upstream of the Redwood Nature Preserve, a distance of approximately 6,000 feet. Most of the flooding occurred in backyards, open land, or parks. However, several homes adjacent to Adobe Creek along this segment and the Garden House at Shoup Park were flooded.

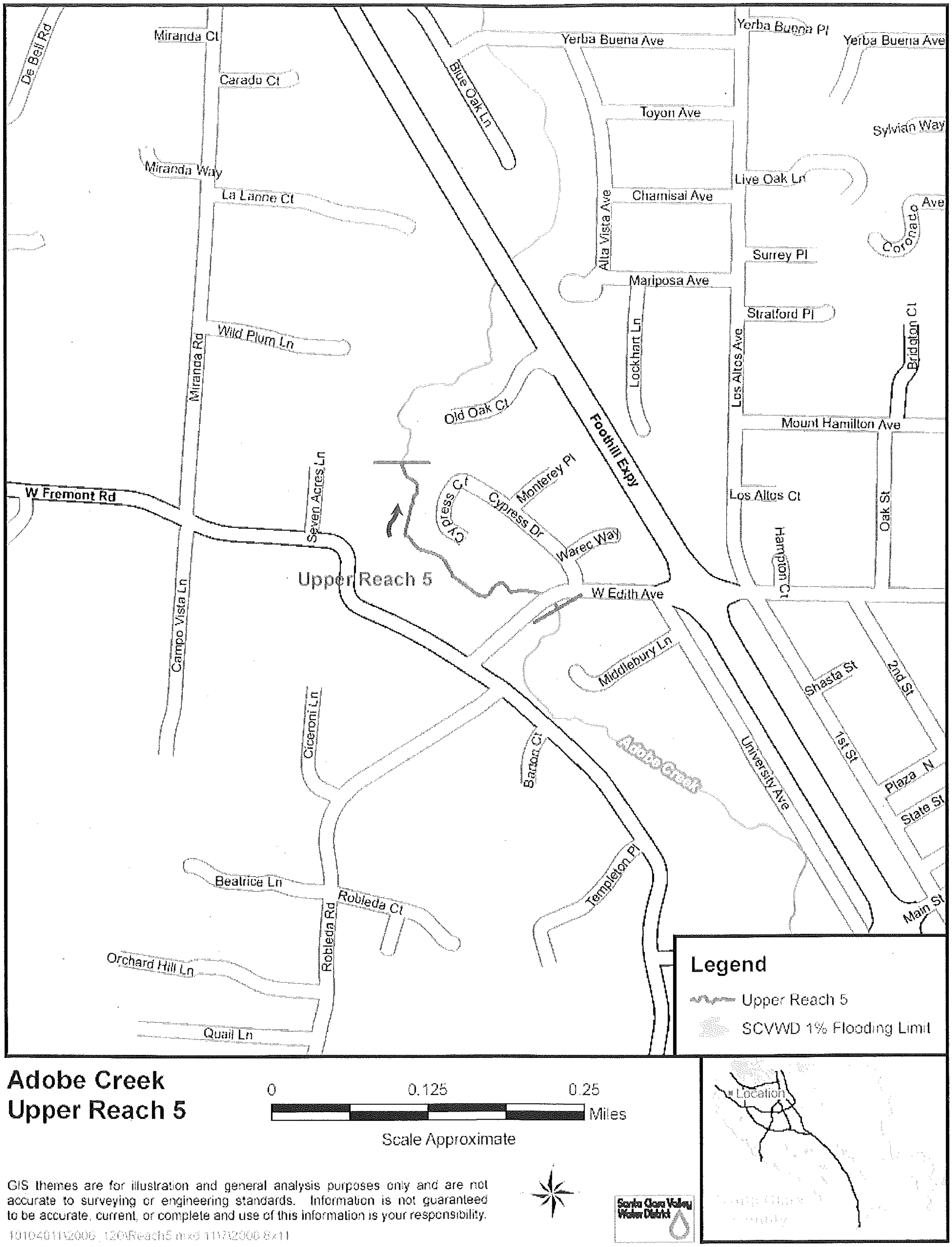

Figure 2-1. Project Location Map

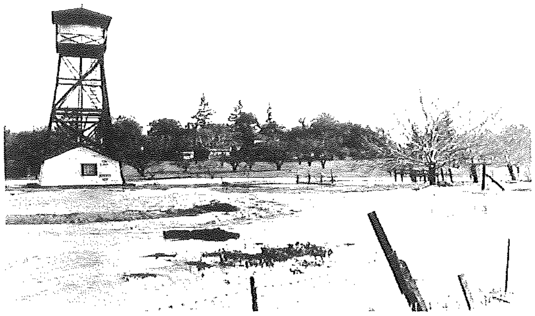

Photo 1. Flooding upstream of West Edith Avenue (as seen from Fremont Road). January 1952

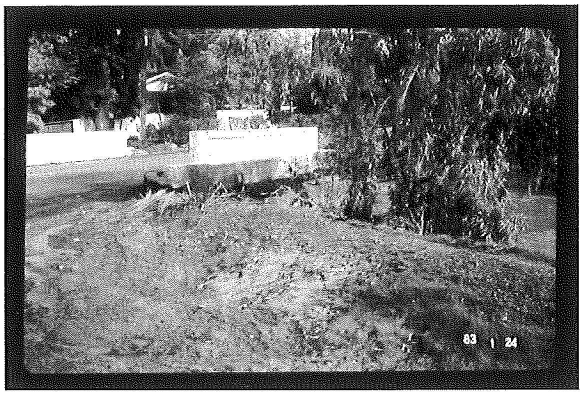

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Photo 2. Evidence of Flooding upstream of West Edith Avenue. January 1983

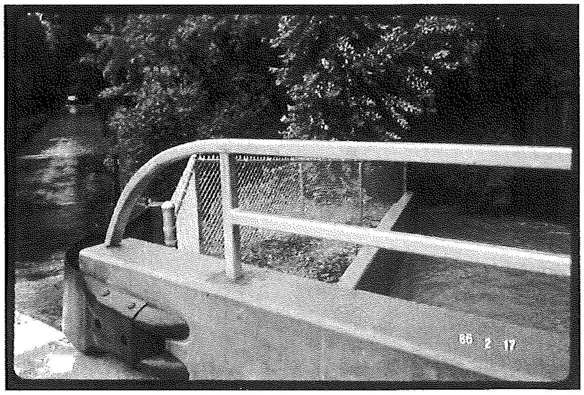

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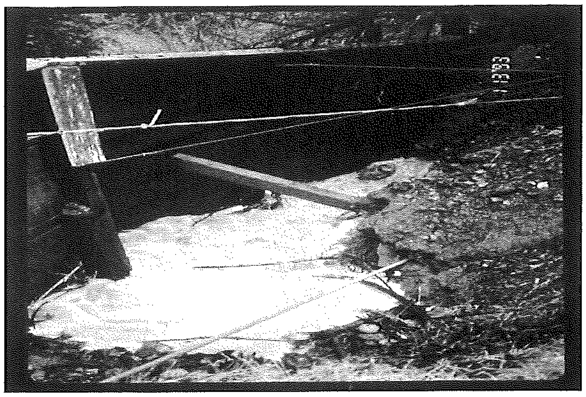
Photo 3. Flooding downstream of West Edith Avenue. February 1986



1993

Photo 4. Bank erosion behind wooden retaining walls downstream of West Edith Avenue. January 1993

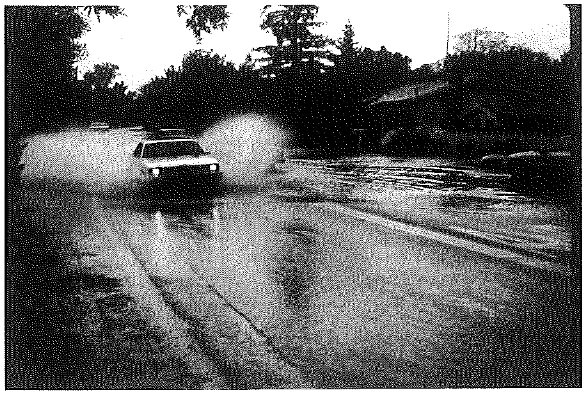


Photo 5. Flooding from Robleda Drain (tributary to Adobe Creek) upstream of West Edith Avenue. January 1995

2.3 HYDROLOGY

In July 1978, the District completed a study of design flood flows for developing flood protection facilities within Santa Clara County. The study included the calculation of the one-percent and ten-percent design flood flows following the District's established hydrology method and procedures. The ten-percent and one-percent flows in Adobe Creek Reach 5 were 1,400 cfs and 2,700 cfs respectively. Recently, the USGS Office of Water Data Coordination changed its procedures in determining the flood flow frequencies of gaged data; thus, the District's hydrology procedures and design flood flows were updated in 2004 by District staff.

The ten-percent and one-percent flood events based on the District updated hydrological methods were calculated at various catch points along Adobe Creek and are shown in the table below:

Table 2-1. Ten-Percent and One-Percent Flood Flows in Cubic Feet per Second at Various Catch Points on Adobe Creek

Catch Points	Basin Area (square miles)	Ten-percent Peak Flow Rate (cfs)	One-percent Peak Flow Rate (cfs)
Adobe Creek at the Burke Road Bridge	6.48	1,243	2,390
Adobe Creek at the West Edith Avenue Bridge	6.53	1,243	2,397
Adobe Creek at the Foothill Expressway Bridge	7.13	1,333	2,571

Source: SCVWD 2005 (Attachment A)

2.4 GEOLOGICAL SETTING

The headwaters of Adobe Creek form in the Santa Cruz Mountains, pass through a narrow alluvial mountain valley, cross the alluvial plain at the base of the Santa Cruz Mountains and pass through shallow marine deposits before entering the Palo Alto Flood Basin. On the alluvial plain the surface soil is black and brown and silty to sandy for a depth of 10 feet. From 10 to 20 feet, the soil is reddish-brown to brown-gravelly sand clay.

The typically thin alluvial fill of the mountain valley (upstream of Interstate 280) is underlain by bedrock which contains and transmits groundwater through fracture and joint openings in the rocks. Within the mountain valley, the movement of the groundwater in the bedrock would be downslope towards the stream from the surrounding hillside through fracture openings and soil cover. As the stream flows within the shallow alluvial fill, it may be locally effluent (groundwater seepage discharging into the stream as surface flow) or locally influent (stream seepage into the underlying bed materials) depending on the season of the year. Therefore, the stream may gain or lose surface flow volume as it passes through this section.

As the channel passes from the mountain valley to the upper alluvial plain near Interstate 280, the soil consists of alternate layers of clay, loam, gravel, sand, and various mixtures of each. The stream becomes primarily influent. The natural streambeds on the upper alluvial plain are one of the primary sources of recharge for the groundwater basins of the Santa Clara Valley, which are sources of domestic water.

The Santa Clara Valley area is recognized as a seismically active region. The closest mapped fault to the project is the Shannon Fault, which is located approximately 2 miles to the southwest. The San Andreas Fault is located approximately 4.7 miles southwest of the site. No mapped faults or fault traces are located in the project area.

2.5 GEOMORPHOLOGY

There is historical evidence that Adobe Creek in Reach 5 once had the capability of flowing across a natural floodplain; however, at present, with development impacts which have modified the top of bank, and storm water inputs from outfalls from impervious areas, the flood plain has been physically constrained. There are also signs of toe erosion at several locations along the channel. Adobe Creek is believed to have had access to a wide flood plain immediately upstream and downstream of the West Edith Avenue Bridge. There are reports of the existence of a small island in the 1920s and 1930s, 200 to 300 feet downstream of the West Edith Avenue Bridge. One side of the island has been filled and the creek has been moved to flow around the northern side of the island (Theis property).

A marshy area existed at the intersection of Robleda Creek and Adobe Creek, downstream of the West Edith Avenue Bridge. This appears to have been filled partially. Robleda Creek was first modified to flow through a wooden culvert and now flows through a 60 inch storm drain.

The section of Adobe Creek located downstream of Robleda storm drain outlet has been deeply eroded along the channel invert. It is likely that the creek invert has dropped in elevation by 2 to 5 feet over the past 100 years.

2.6 HAZARDOUS MATERIALS

A Phase I Hazardous Materials Assessment was conducted by Terratech in 1994 along the creek channel downstream of the West Edith Avenue Bridge. The assessment concluded that there are no known sources of potential contamination along the creek.

A Phase I Hazardous Substance Liability Assessment was conducted by Earth Tech in May 2005 to verify the results of the 1994 assessment. The assessment confirmed the 1994 results that the site is free of obvious contamination.

2.7 PREVIOUS ENGINEERING STUDIES AND CONSTRUCTION PROJECTS

1956 District Capital Improvement Project

In 1956, a plan was adopted for providing flood and erosion control protection along Adobe Creek from Alma Street in Palo Alto to the vicinity of Tepa Way in Los Altos Hills. The plan consisted of a trapezoidal concrete channel from Alma Street to 1,100 feet upstream of West Edith Avenue and an excavated earth channel from West Edith Avenue to 1,200 feet upstream of El Monte Avenue. In 1959 the District constructed a trapezoidal concrete channel from Alma

Street to El Camino Real. The channel construction did not continue upstream of El Camino Real due to public opposition to the proposed channel modifications.

1985 Replacement of West Edith Avenue Bridge

The old West Edith Avenue Bridge was known to contribute to flooding in the area. In 1985, the bridge was replaced through a joint effort of the District, the City of Los Altos, and the Town of Los Altos Hills. The new bridge was expanded from approximately 23-feet to a 40-foot wide bridge.

1998 Installation of Robleda Storm Drain

The Robleda storm drain, a 60-inch diameter concrete pipe, was constructed in 1998 to help relieve local flooding problems along Robleda Road.

1999 Adobe Creek Watershed Planning Study

The Adobe Creek Watershed Planning Study was completed in May 1999 and adopted by the Board on June 15, 1999.

Erosion Repair and Sediment Removal Projects

Erosion is an ongoing problem that requires attention throughout the project area. Between 1994 and 2005, the District completed erosion and sediment removal projects along Adobe Creek Reach 5 at 25661 West Fremont Road (rock slope bank stabilization) and 14116 Seven Acres (crib wall bank stabilization).

Chapter 3. Project Objectives and Criteria for Formulation and Evaluation of Alternatives

3.1 PROJECT OBJECTIVES

The Project objectives were developed by the District and the Collaborative during a series of almost monthly meetings held between September 2003 and April 2004. The project objectives were included in the Project Plan for Adobe Creek Upper Reach 5 Restoration Project, which was finalized by the Collaborative in April 2004.

The project objectives are as follows:

1. Correct the existing erosion to protect residences and creekside structures and stabilize creek banks.

2. Open Upper Reach 5 to eliminate backwater effects in Reach 6 by providing a scaled-down project (i.e., less than one-percent flood protection) to a level of flooding acceptable to the Collaborative and derived from the concept of a restored creek that recognizes landowner constraints. *(Board Policy E-2.2 There is reduced potential for flood damages).*

    2a. Establish detailed hydrology in the vicinity of Reach 5 to determine anticipated in-channel and overland flow volumes on W. Edith Avenue and W. Fremont Road during events ranging from a ten-percent to a one-percent flood, at intervals agreed upon by the Collaborative.

    2b. Improve existing channel conveyance capacity immediately downstream of W. Edith Avenue Bridge to convey, at a minimum, the in-channel flow volume anticipated to flow under the bridge during a one-percent flood at W. Edith Avenue Bridge.

    2c. Evaluate the options of expanding channel capacity downstream of the W. Edith Avenue Bridge to accept additional overland flows from W. Fremont Road and W. Edith Avenue during one-percent and lesser floods. *(Board Policy E-2.2 There is reduced potential for flood damages)*

    2d. Provide clear and documented understanding and acknowledgement of the existing flooding conditions in the vicinity of W. Fremont Road and W. Edith Avenue to the affected property owners and the Town of Los Altos Hills.

    2e. Improve sediment transport to maintain channel capacity at W. Edith Avenue Bridge and minimize long-term maintenance.

3. Protect and enhance the creek ecosystem. *(Board Policy E-3.1 Watersheds, streams and natural resources therein are protected and when appropriate, enhanced or restored.)*
   - 3a. Restore the riparian environment
   - 3b. Maintain the creek's meander as appropriate
   - 3c. Create stable side slopes that will minimize erosion
   - 3d. Preserve as many trees as possible, including some non-natives
   - 3e. Blend replanting of large and small trees
   - 3f. Provide fish passage
   - 3g. Improve stream percolation capability

4. Minimize impact of mitigation on the community.
   - 4a. Self-mitigating to the greatest extent possible
   - 4b. Additional mitigation sites, if necessary will be acceptable to the Collaborative
   - 4c. Create minimal disturbance to Edith Park

5. Minimize maintenance costs
   - 5a. Provide long-term access for creek maintenance
   - 5b. Minimize access road impacts
   - 5c. Develop a well defined ongoing maintenance plan/guidelines

6. Create an aesthetically pleasing project which is acceptable to the team and the Collaborative.

7. Collaborate to reach a successful conclusion in a timely manner

8. Provide for limited ingress and egress and for safety of children, residents, and the community.

9. Respond to all the Collaborative's concerns/issues regarding channel improvements and tree removal as documented during the Adobe Collaborative process in fall 2003.

10. Project work will re-evaluate the hydrology and hydraulics at the Burke Road Bridge in concert with the modeling of reaches 5, 6, and 7 to determine appropriate timing of Burke Road Bridge replacement.

11. Protect, in perpetuity, the existing floodplain and overland flow paths, especially from man-made obstructions.

3.2 FORMULATION OF ALTERNATIVES

Right-of-Way Criterion

The right-of-way criterion established by the Collaborative is to obtain binding commitment to provide necessary easements before project initiation and modify the meander at APN 175-11-062, if appropriate. The initial concept for the easement criterion was to maintain the existing top of bank on the Los Altos creekside and widen the channel towards the Los Altos Hills creekside, based on the 40-foot width of the West Edith Avenue bridge. Staff later held field meetings with property owners of the Los Altos Hills creekside to stake the proposed easement line with the property owners before finalizing the limits. The available easements include the areas shown between the blue lines (blue line limits) in Figure 3-1, with additional easement area to be used only for mitigation planting, as necessary. The site access and staging area requirement would minimize disturbance to Edith Park.

Vegetation Criterion

The vegetation criterion established by the Collaborative is to save the majority of the existing redwood trees along the Los Altos side of the creek and minimize the removal of existing trees along the Los Altos Hills side of the creek. Vegetation identified by the Collaborative as "trees of particular value" and "trees to save if possible" are shown in Figure 3-1.

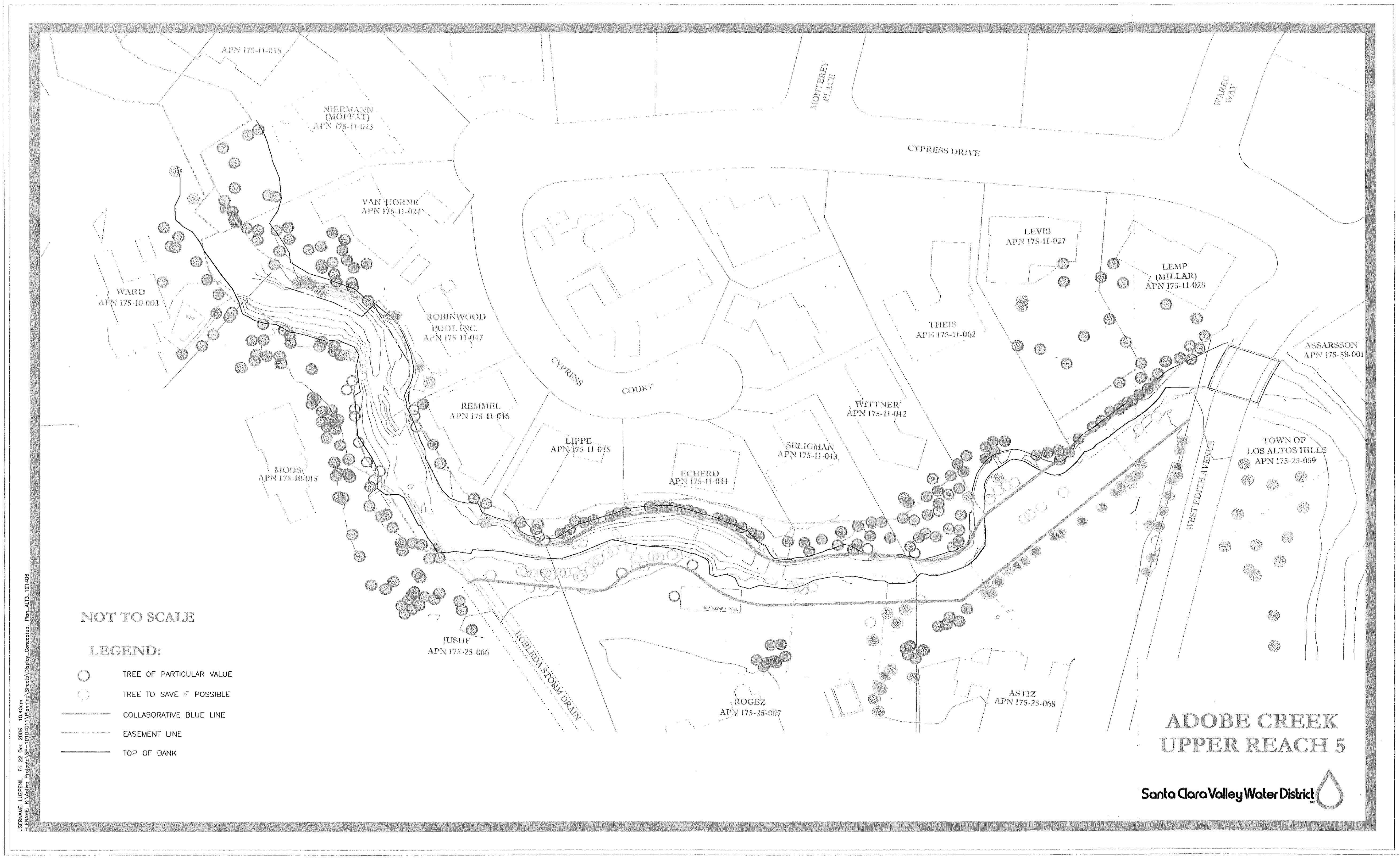


Figure 3-1. Project Map showing Right-of-way Criterion and Vegetation Criterion for Adobe Creek Upper Reach 5 Project

Channel Capacity Criterion

The channel capacity criterion was established based on the parameters set forth in Project Objective #2, which included:

1) The community's desire to increase the capacity of Adobe Creek Upper Reach 5, but to scale the project down from the 1999 proposed project to a less-than-one-percent flood protection project. The community requested that creekside landowners' constraints be recognized.

2) The community's desire to improve the existing channel downstream of the West Edith Avenue Bridge to convey, at a minimum, only the portion of the in-channel flow volume anticipated to flow under the West Edith Avenue bridge during the one-percent flood (Project Objective 2b), instead of the full one-percent flow volume.

Channel Capacity – Detailed hydraulic modeling was conducted for Adobe Creek Reaches 5 and 6 (from Foothill Expressway upstream to Burke Road) to determine both the volume of flow that would be conveyed under the West Edith Avenue Bridge during various storm events and the volume and flow path of overland flow in the vicinity of West Edith Avenue and Fremont Road.

As shown in Figure 3-2, the existing channel between the West Edith Avenue Bridge and the Robleda Storm Drain outlet has a flow conveyance capacity range of 500 cfs to 2,400 cfs. The existing channel downstream of the Robleda Storm Drain outlet has been heavily incised and can convey the one-percent peak flow (between 2,400 cfs and 2,600 cfs) to Foothill Expressway.

Upstream of West Edith Avenue (Reach 6) hydraulic modeling determined that the limiting channel flow conveyance capacity is a section of creek in Edith Park, approximately 425 feet upstream of the West Edith Avenue Bridge. The capacity in the channel at this location (see Figure 3-2) is approximately 450 cfs. Higher creek flows will jump the banks and spread over Edith Park. Some of this overbank flow may eventually return to the channel further downstream and be conveyed under the West Edith Avenue Bridge.

As the creekside landowners' constraints evolved into the Collaborative "blue line limits" described in an earlier section, a stable channel configuration, combined with hydraulic modeling, indicated that an expanded channel within the blue lines would remain stable for flow volumes of up to 1,100 cfs (close to a ten-percent event as per District's hydrology). The Collaborative agreed on a minimum channel capacity criterion of 1,100 cfs for the channel from West Edith Avenue downstream to the Robleda Storm Drain outlet.

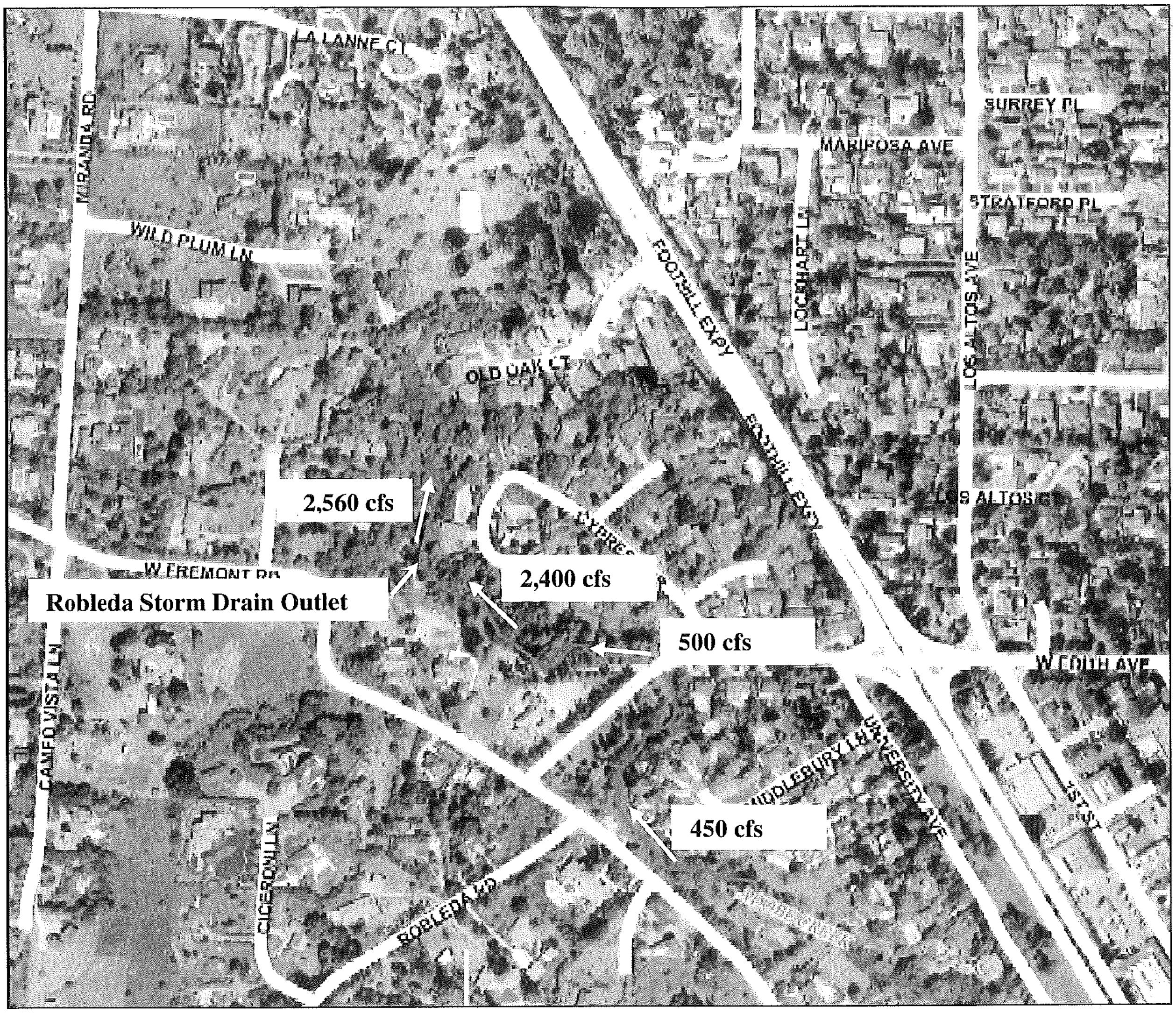


Figure 3-2. Channel Capacities at Various Locations along Adobe Creek

Overland Flows – As described in the previous section, hydraulic modeling results indicate that the limiting conveyance capacity in Reaches 5 and 6 of Adobe Creek is in Edith Park. Reach 6 is an upstream floodplain that affects the flow in Reach 5. When creek flows exceed the channel capacity, they will overtop the banks and spread over Edith Park. Some flows may eventually return to the channel and be conveyed under the West Edith Avenue Bridge, but in extremely high flow events, overbank flows will cross West Edith Avenue and flow overland until they rejoin Adobe Creek further downstream.

During the Collaborative process, residents expressed concerns over the use of the District's design flood flows because the design flood flows were not consistent with residents locally observed hydrologic records. Mr. Leonard Robinson, who has been a creekside resident since 1955, reported that he observed the largest creek flow volume conditions in 1998, when creek water flooded his living room for the only time in his residency. In addition, Mr. George Cummings II, who has been a creekside resident since 1911, reported that he observed flood water overflowing Burke Road only once, in approximately 1920, and on this occasion, a tree had fallen into the creek just upstream of the bridge. No other residents have reported ever seeing water flow over Burke Road.

Because the residents locally observed hydrologic records were lower than the Districts design flood flows, the community overwhelmingly supported a less-than-one-percent flood protection project and are willing to live with the risk of occasional overland flow in the vicinity and downstream of West Edith Avenue; hence, detailed two-dimensional modeling were conducted to determine the probable depth and extent of overland flows in the vicinity of Edith Park and West Edith Avenue.

Figure 3-3 provides a plan view of anticipated overland flow extent in the event of a ten-percent flood (1,245 cfs) under existing conditions and with an expanded creek channel limited to the blue lines limit.

Similarly, Figure 3-4 provides the before- and after-project overland flow conditions in the vicinity of West Edith Avenue and Fremont Road for a one-percent (2,400 cfs) event. Based on the two-dimensional modeling coupled with the channel hydraulics analysis, the volume of flow conveyed under the West Edith Avenue Bridge would be approximately 1,160 cfs, very close to the established in-channel stable conveyance capacity of 1,100 cfs.

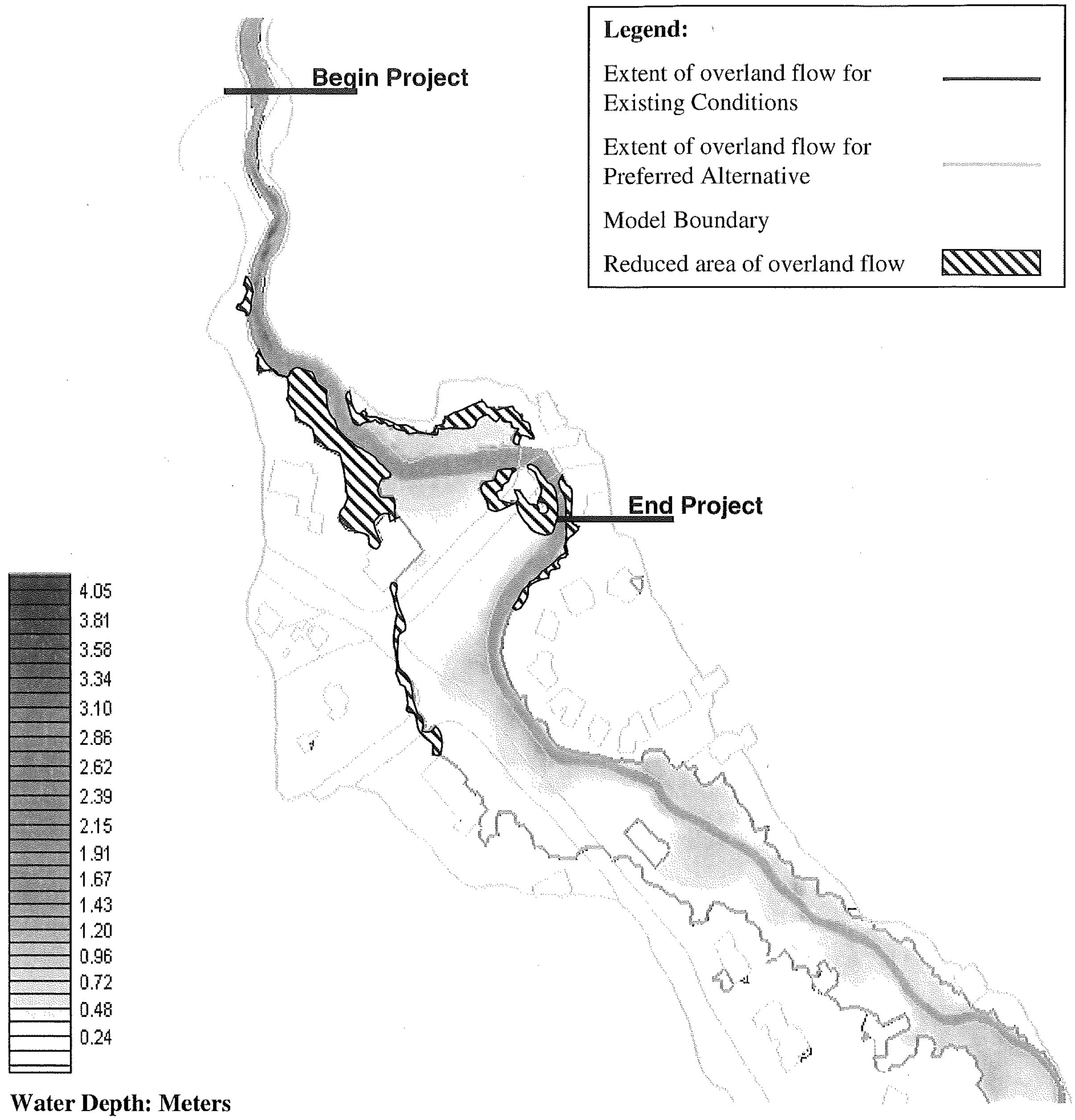


Figure 3-3. Adobe Creek Upper Reach 5 extent of overland flow for 1,245 cfs

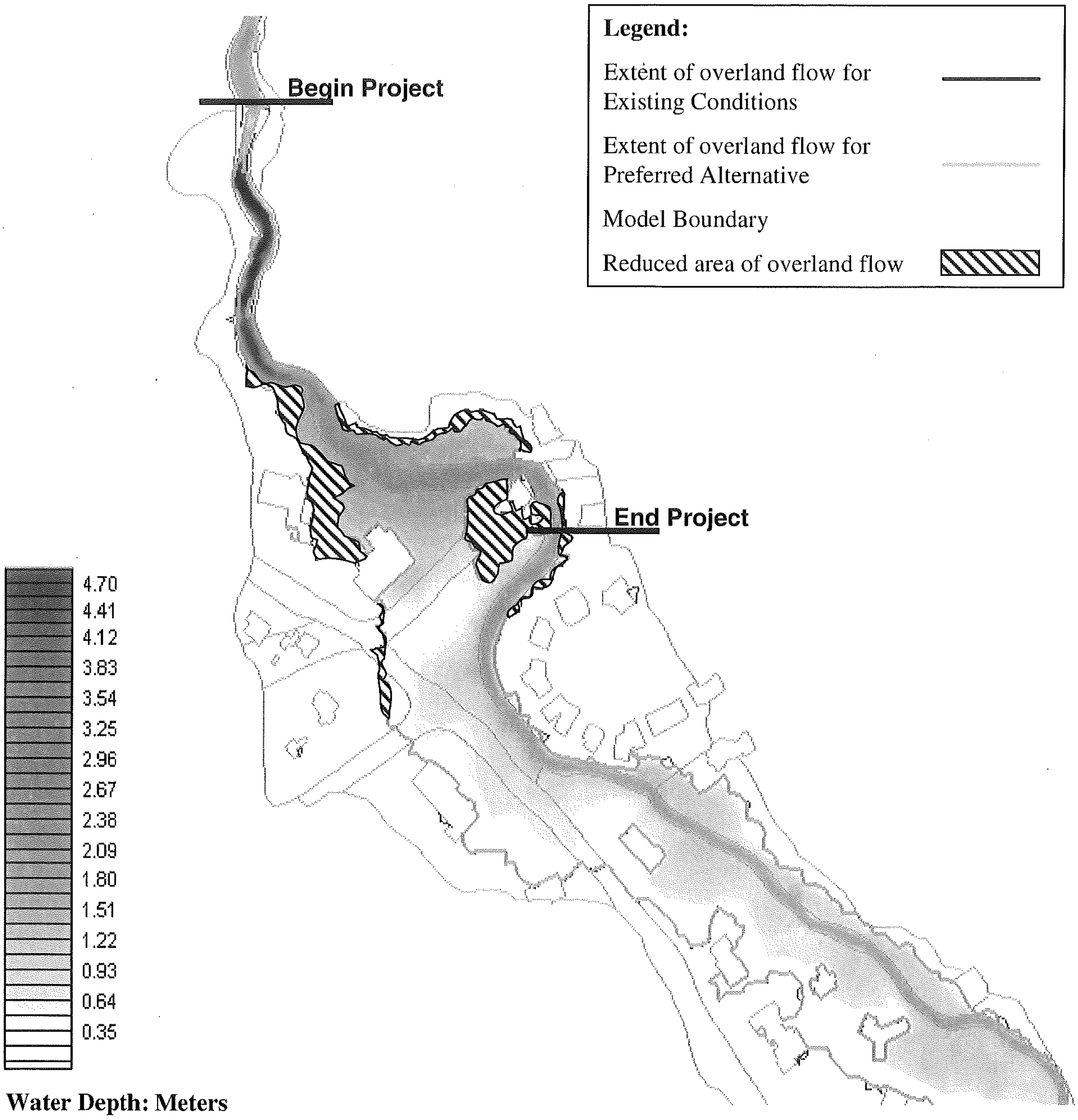


Figure 3-4. Adobe Creek Upper Reach 5 extent of overland flow for 2,400 cfs

3.3 EVALUATION OF ALTERNATIVES

Impacts of Mitigation

Alternatives considered for the project would minimize impacts of mitigation on the community. Alternatives would be self mitigating to greatest extent possible and create minimal disturbance to Edith Park.

Public Acceptance

Alternatives considered for the project would be aesthetically pleasing to the Collaborative and address all of the Collaborative's concerns/issues regarding channel improvements and tree removal documented during the Collaborative process.

Channel Invert Stability

Alternatives considered for the project would address the existing erosion problems to protect residences and creekside structures and stabilize creek banks. Channel invert stability analysis was performed for the preferred alternative using the Stable channel Analytical Model (SAM) developed by the US Army Corps of Engineers. During final design, the channel invert slopes of the preferred alternative will be adjusted to balance the sediment transport between the project reach and the reaches immediately upstream and downstream.

Channel Cross Section Configuration

Alternatives considered for the project would apply geomorphic principles for a stable channel configuration. Surveys of stable reference reaches along Adobe Creek between Foothill Expressway and Hidden Villa were conducted in fall 2004. Based on the stable reference reaches, the minimum bankfull width established for the project is 15 feet.

Chapter 4. Development of Alternatives

Alternatives for the project were developed in an iterative process over a period of time with the Collaborative. As part of the Collaborative process, monthly meetings and smaller working group meetings were held to screen and evaluate alternatives. Collaborative members actively and strongly participated in the evolution of proposed alternatives and often proposed variations or changes in staff-proposed alternatives during the Collaborative meetings.

Alternatives for the project addressed channel improvements and erosion repair work. Channel improvements would begin just upstream of the West Edith Avenue Bridge and extend approximately 700 lineal feet to the Robleda Storm drain outlet. This portion of the creek consists of the creek channel and a flood plain. Erosion repair work would continue downstream of the Robleda storm drain outlet. This portion of the creek consists of an incised channel.

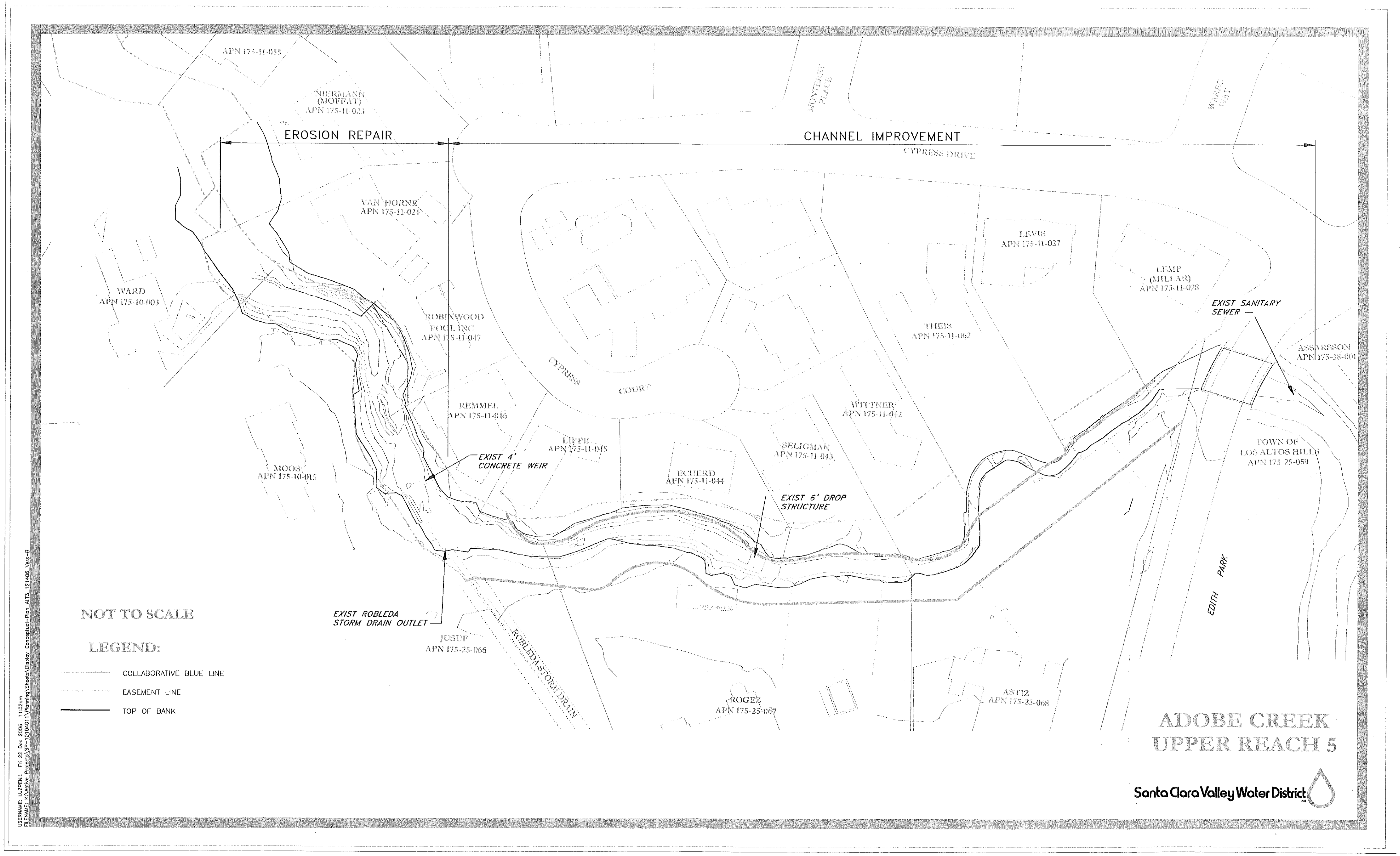


Figure 4-1. Project Map showing Channel Improvement and Erosion Repair Limits

4.1 CHANNEL IMPROVEMENT ALTERNATIVES

Alternative 1 – No Project

The "No-project" alternative is the "existing conditions" and evaluates the 'likely" future conditions in the project area without implementation of the recommended project. Under the "No project" alternative, reduced flooding and erosion repair would not be accomplished; thus, the "No project" alternative does not meet the project objectives of increasing channel flow capacity, addressing the existing erosion to protect residences and creekside structures and stabilize creek banks; hence this alternative was not acceptable to the Collaborative.

Alternative 2 – Geomorphic

In February 2005, staff developed Alternative 2 for the project based on data of stable channel cross sections collected from field surveys of stable reference reaches along Adobe Creek between Foothill Expressway and Hidden Villa. A geomorphic cross section was considered because this concept would provide a stable, natural creek configuration that would minimize long-term maintenance and allow for a self-mitigating project. This alternative consists of an excavated 17-foot wide low flow channel, with a 10-foot wide bench on both sides of the low flow channel, and 1:1 bank slopes above the bench, for 700 feet downstream of the West Edith Avenue Bridge. In order to reduce the steep slope of this channel, several step-pools are included in this alternative, evenly spaced along the channel between West Edith Avenue and the Robleda Storm drain Outlet. All step-pool structures are designed to be "fish passable."

A typical cross section for this alternative is shown in Figure 4-2.

This alternative does not meet the right of way criterion of the project because the channel top width exceeds the blue line limits. Even though the channel top width for this alternative exceeds the blue line limits, regulatory agencies supported maximizing the top width of the channel because of improvements to the water quality and beneficial uses of the channel.

Also, this alternative does not meet the vegetation criterion for the project because of the loss of several trees identified by the Collaborative as "trees of particular value." This alternative was not acceptable to the Collaborative.

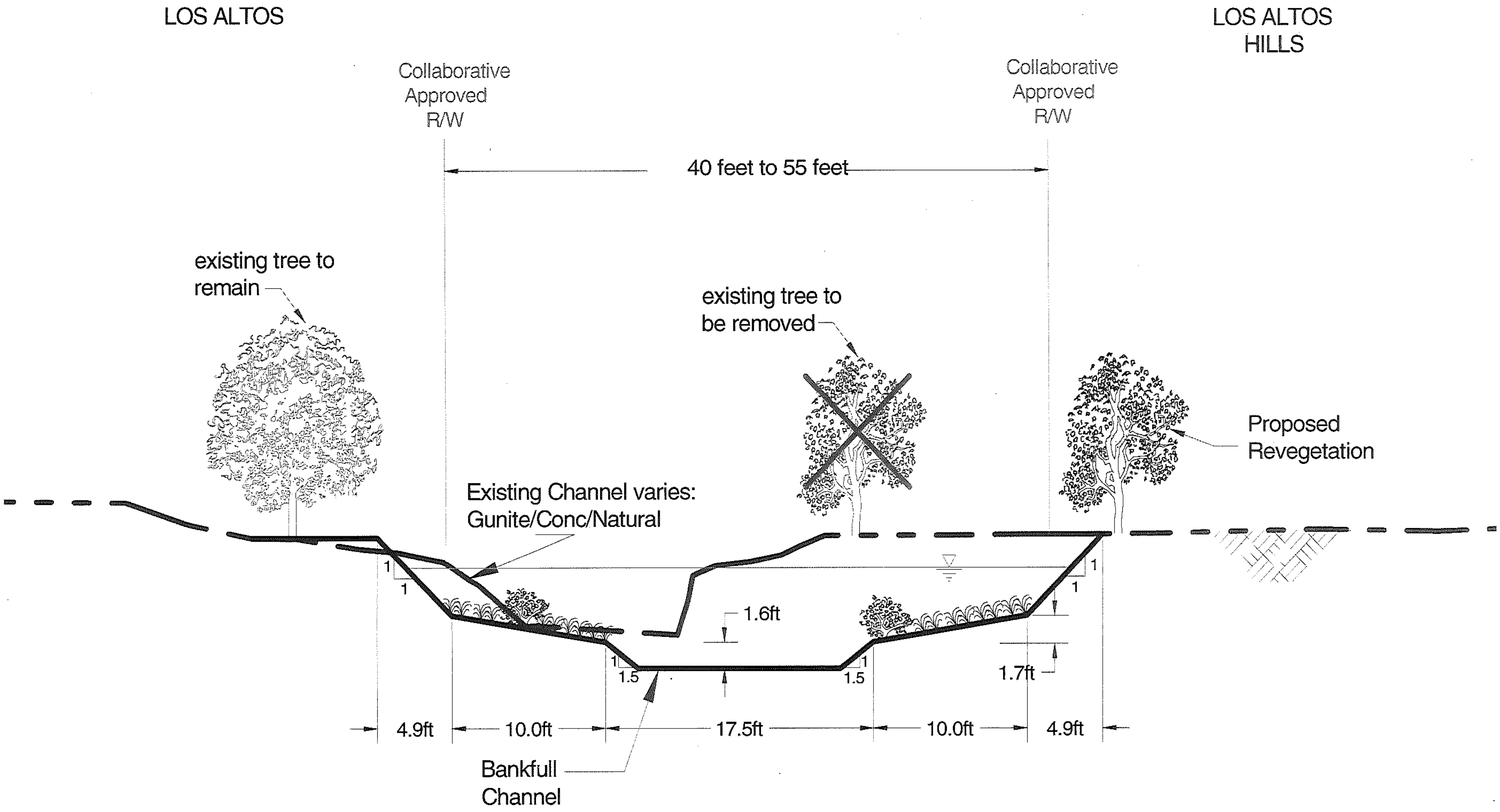


Figure 4-2. Alternative 2 – Typical Cross Section

Alternative 3 – Geomorphic with Step-pools

In April 2005 staff developed Alternative 3, which reduced the top width, but is otherwise the same as Alternative 2. The width of the low flow channel was reduced to 16 feet, the width of the bench was reduced to 9 feet on both sides of the low flow channel, and the bank slopes were reduced to less than 1:1 above the bench, for 700 feet downstream of the West Edith Avenue Bridge. This resulted in steep banks in some locations along the channel.

A typical section for this alternative is shown in Figure 4-3.

This alternative does not meet the right of way criterion of the project because, in an attempt to remain true to the geomorphic principles established for this reach of Adobe creek, the channel top width still exceeded the blue line limits at some locations along the channel. Even though the channel top width for this alternative exceeds the blue line limits, regulatory agencies supported maximizing the top width of the channel because of improvements to the water quality and beneficial uses of the channel.

Also, this alternative does not meet the vegetation criterion for the project because of the loss of some trees identified by the Collaborative as "trees of particular value." This alternative was not acceptable to the Collaborative.

Alternative 4 – Geomorphic with Cascading Step-pools

Alternative 4 was also developed in April 2005. It is nearly the same as Alternative 3; however, under Alternative 4, between the West Edith Avenue Bridge and the Robleda Strom Drain outlet, the step-pools would begin 500 feet downstream of the West Edith Avenue Bridge and be installed in a more concentrated fashion over a 200-foot length (see Figure 4-4 for a profile comparison of Alternatives 3 and 4).

A typical cross section for this alternative is shown in Figure 4-3.

This alternative does not meet the right of way criterion of the project because the channel top width exceeded the blue line limits at some locations along the channel. Even though the channel top width for this alternative exceeds the blue line limits, regulatory agencies supported maximizing the top width of the channel because of improvements to the water quality and beneficial uses of the channel.

Also, this alternative does not meet the vegetation criterion for the project because of the loss of some trees identified by the Collaborative as "trees of particular value." This alternative was not acceptable to the Collaborative.

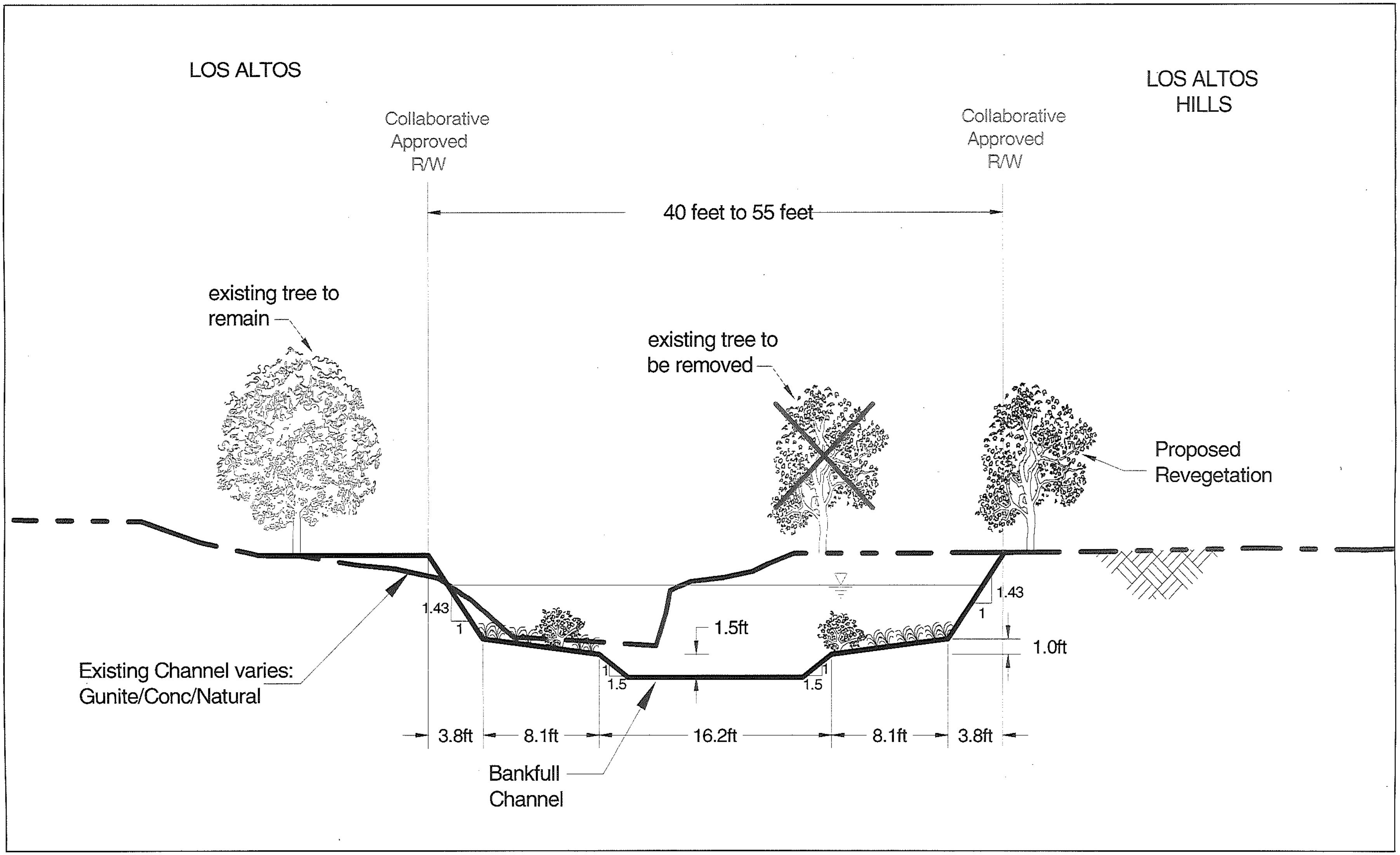


Figure 4-3. Alternatives 3 and 4 – Typical Cross Section

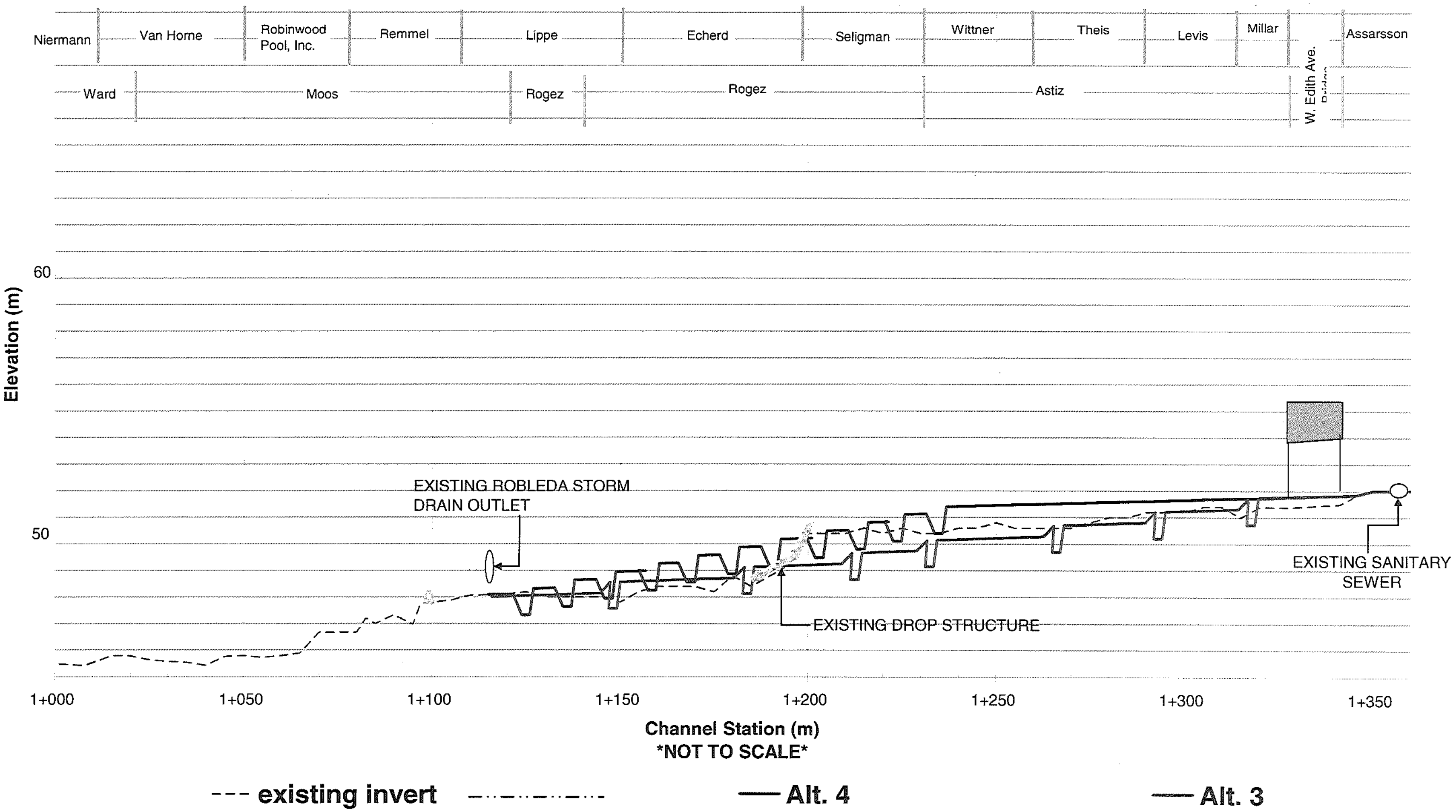


Figure 4-4. Alternatives 3 and 4 – Profile Comparison

Alternative 5 – Rock Lining Downstream West Edith Avenue

In May 2005 staff developed Alternative 5 at the request of the residents as an alternative for channel improvements that do not exceed the blue line limits. This alternative consists of an excavated rock riprap-lined channel with a 10-foot wide bottom width, and approximately 40-foot to 50-foot top width for 700 feet downstream of the West Edith Avenue Bridge. In order to reduce the steep slope of this channel, step-pools are included in this alternative, evenly spaced along the channel between the West Edith Avenue Bridge and the Robleda Storm drain outlet. All step-pools are designed to be "fish passable."

A typical cross section for this alternative is shown in Figure 4-5.

This alternative meets the right of way and vegetation criterion of the project; however, this alternative does not meet the project objective of minimizing the impact of mitigation on the community because of the quantity of rock riprap lining proposed for this alternative. This alternative was not acceptable to the Collaborative.

Alternative 6 – Geomorphic with Step-pools and Retaining walls

In June 2005, staff developed Alternative 6 which does not exceed the blue line limits agreed upon by the Collaborative, but is otherwise the same as Alternative 3, except under Alternative 6, retaining walls are included along the channel banks at some locations to keep the channel top width within the right of way limits agreed upon by the Collaborative.

A typical cross section for this alternative is shown in Figure 4-6.

This alternative meets the right of way and vegetation criterion of the project; however, this alternative does not meet the project objective of minimizing the impact of mitigation on the community because of the amount retaining walls proposed for this alternative. This alternative was not acceptable to the Collaborative.

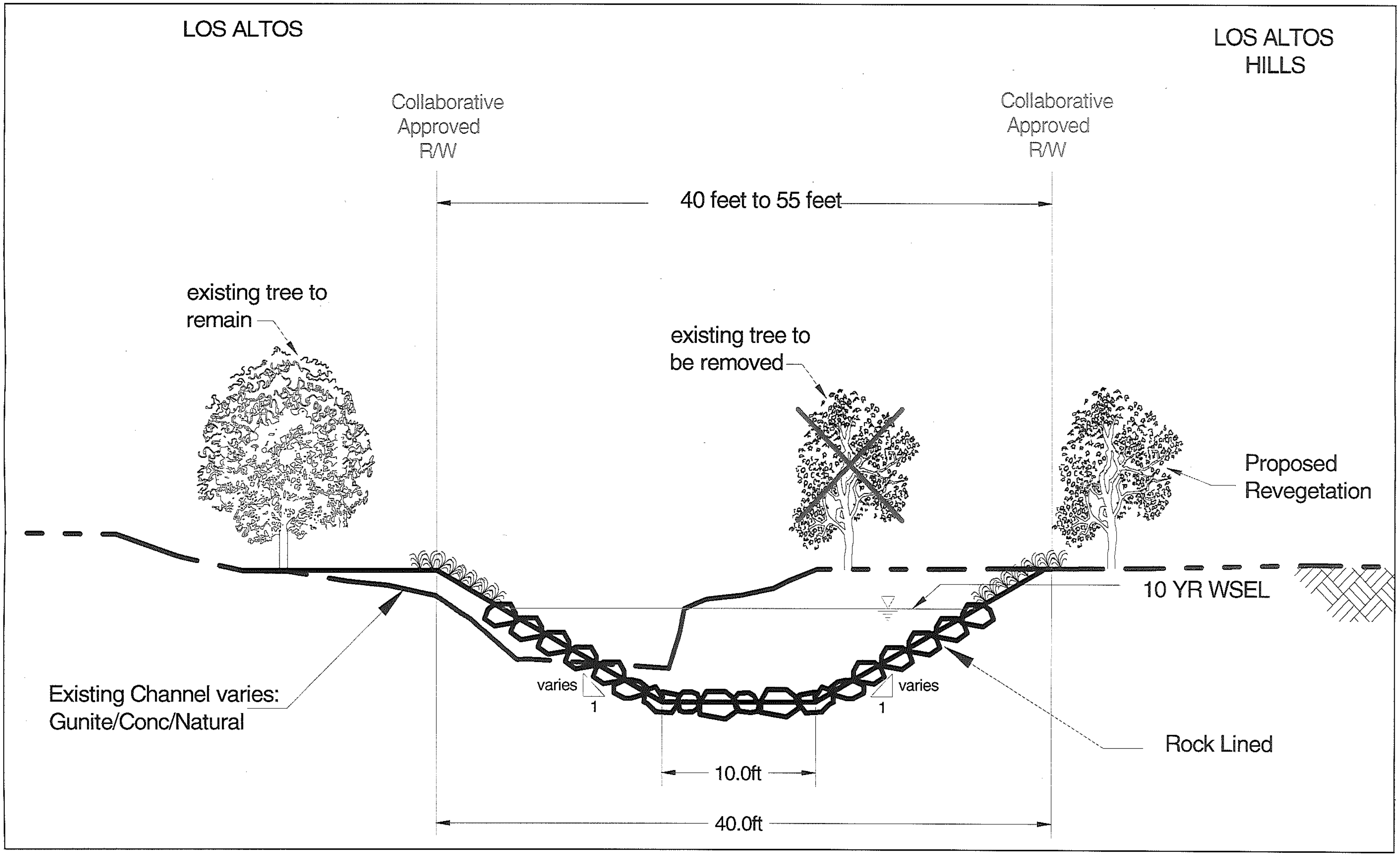


Figure 4-5. Alternative 5 – Typical Cross Section

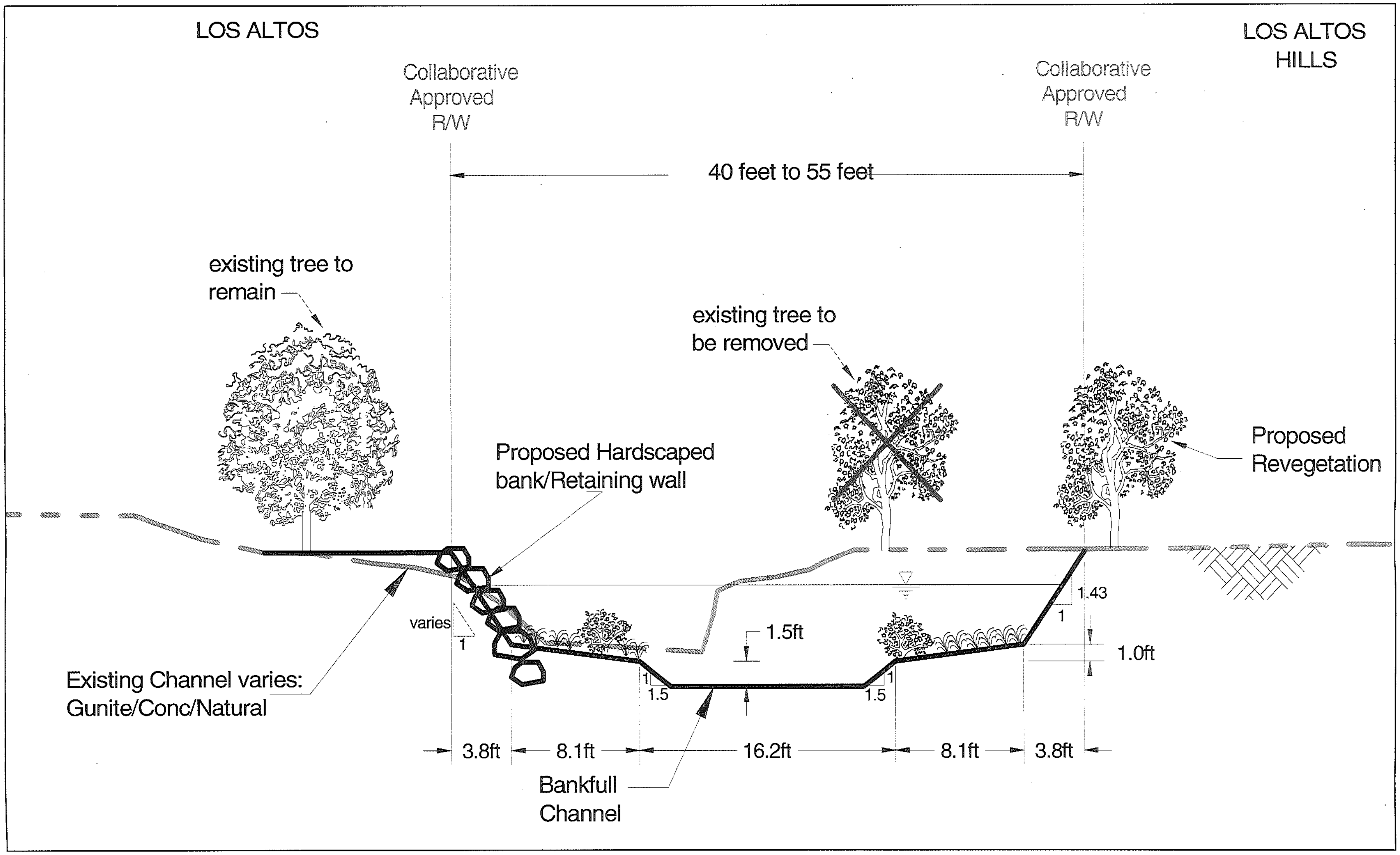

LOS ALTOS
LOS ALTOS HILLS
Collaborative Approved R/W
Collaborative Approved R/W
40 feet to 55 feet
existing tree to remain
existing tree to be removed
Proposed Revegetation
Proposed Hardscaped bank/Retaining wall
varies
1
1.43
1
1.5ft
1.0ft
1
1.5
1
1.5
Existing Channel varies: Gunite/Conc/Natural
3.8ft
8.1ft
16.2ft
8.1ft
3.8ft
Bankfull Channel

Figure 4-6. Alternative 6 – Typical Cross Section

Alternative 7 – Modified Geomorphic with Step-pools

Between July 2005 and October 2005, staff developed Alternative 7 with the Collaborative, through a series of discussions and field meetings with residents centered on eliminating the retaining walls proposed in Alternative 6. Alternative 7 is otherwise the same as Alternative 6, except in order to eliminate the retaining walls proposed in Alternative 6, additional right of way was provided by one property owner on the Los Altos Hills side, allowing the channel top width to extend past the right of way limits agreed upon by the Collaborative for the Los Altos Hills creekside. Also, the width of the low flow channel was reduced to 15-feet and the channel cross section was truncated at the bench on the Los Altos side, which prevented the channel top width from exceeding the right of limits agreed upon by the Collaborative for the Los Altos creekside and eliminates the retaining walls proposed in Alternative 6.

A typical cross section for this alternative is shown in Figure 4-7.

In December 2005, staff and a District consultant, performed further analysis on this alternative to evaluate the channel stability. Analysis using HEC-RAS computer models indicated that this alternative would have a high potential for channel erosion. This alternative was not acceptable to the Collaborative.

Alternative 8 – Modified Geomorphic with Cascading Step-pools

Between January 2006 and May 2006, staff developed Alternative 8, which is the same as Alternative 7, except that the step-pools would begin 500 feet downstream of the West Edith Avenue Bridge and continue for 200 feet downstream as proposed in Alternative 4 (see Figure 4-8 for a profile comparison of Alternatives 7 and 8).

A typical cross section for this alternative is shown in Figure 4-7.

Analysis using HEC-RAS computer models indicated that this alternative would be stable from the West Edith Avenue Bridge to 500 feet downstream. The step-pool portion of the channel, which begins 500-feet downstream of the West Edith Avenue Bridge and continue for 200 feet downstream, would be stabilized using rock riprap.

An additional channel stability analysis was performed on this Alternative 8, for the portion of the channel from the West Edith Avenue Bridge to 500-feet downstream, using the Stable Channel Analytical Model (SAM) developed by the US Army Corps of Engineers. The channel invert slopes of the alternative were adjusted based on the SAM results to balance the sediment transport capacity achieved between the project reach and the channel reaches immediately upstream and downstream of the project.

Table 4-1 summarizes the evaluation of the channel modification alternatives for the Project.

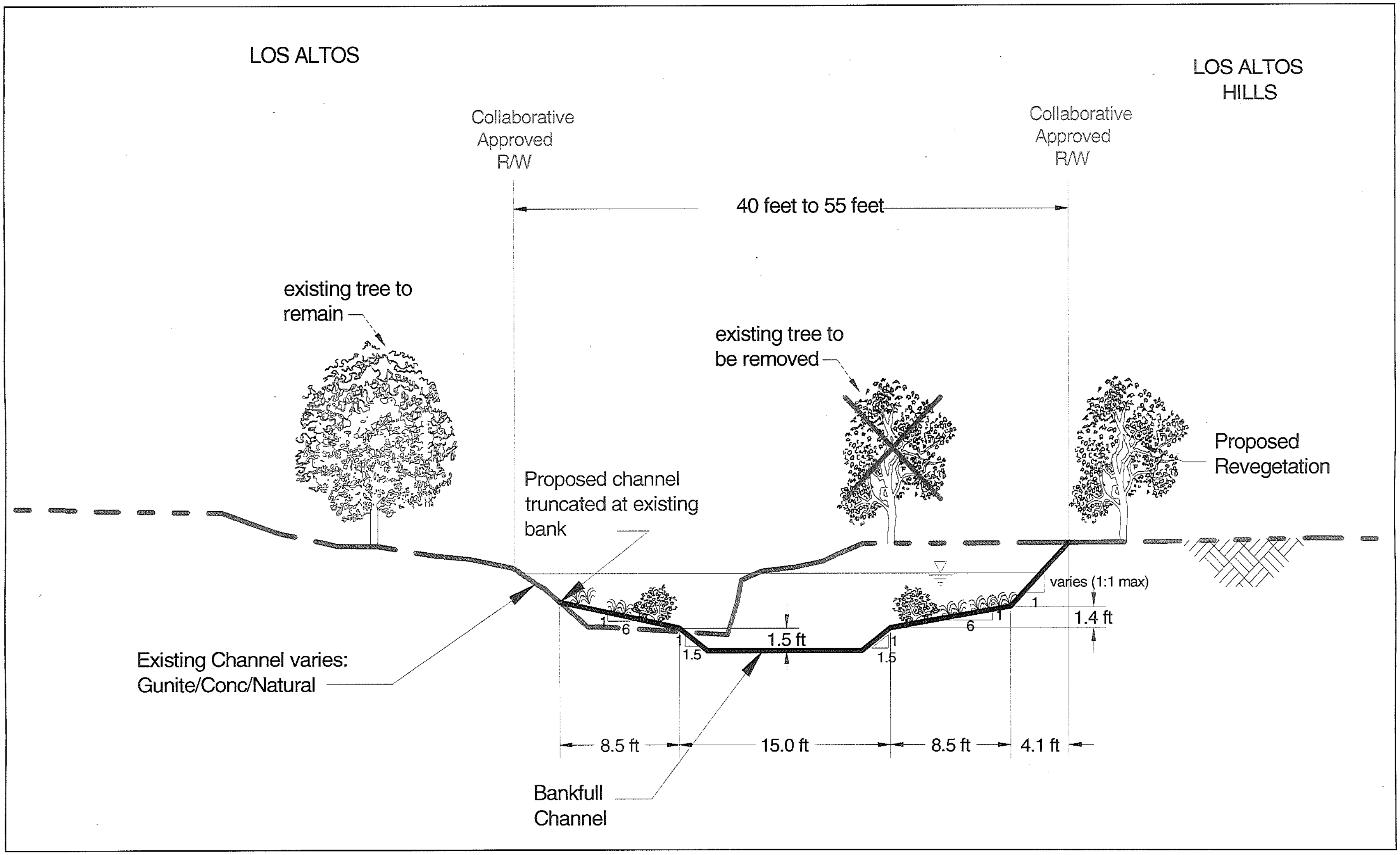


Figure 4-7. Alternatives 7 and 8 – Typical Cross Section

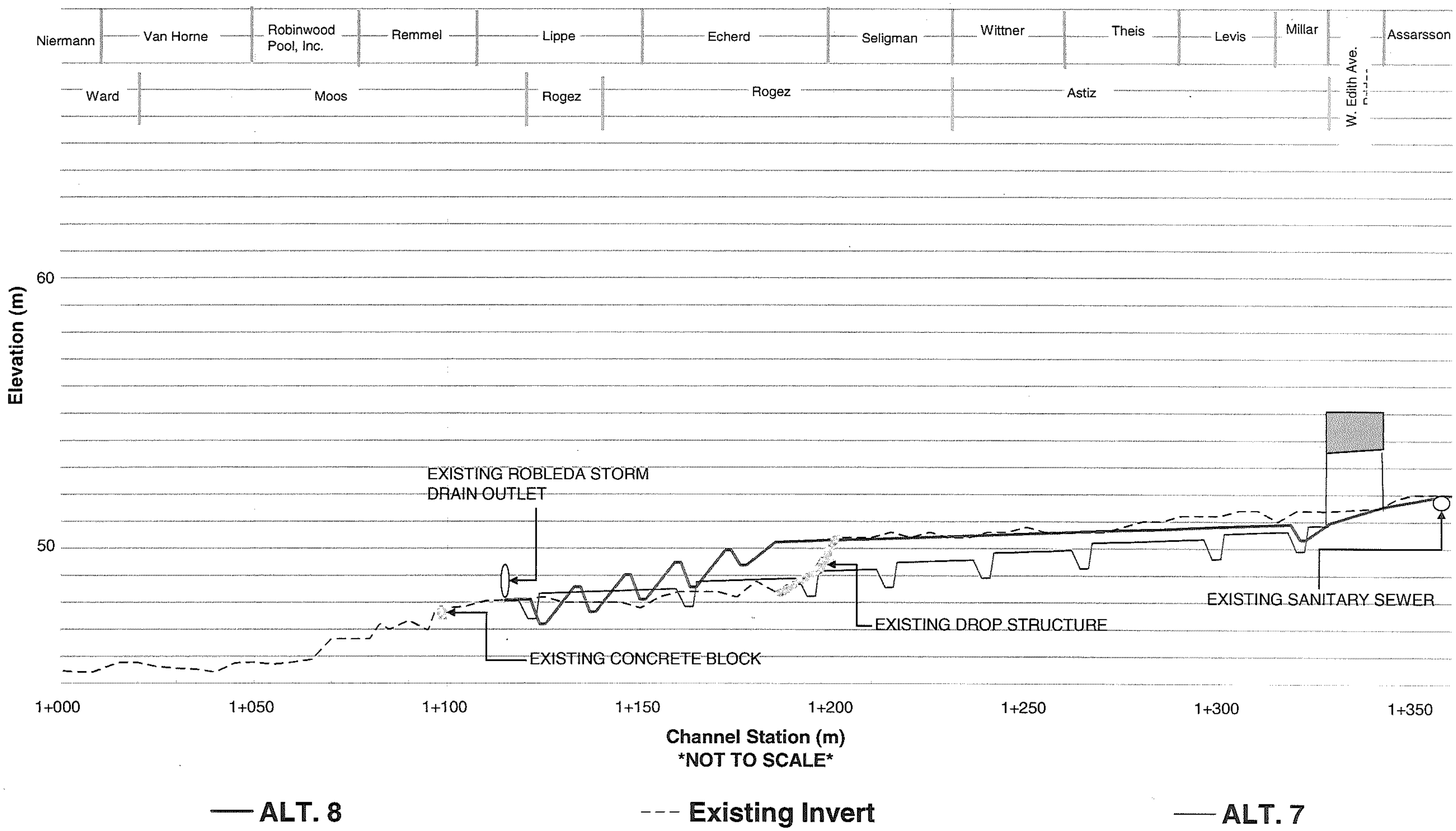


Figure 4-8. Alternatives 7 and 8 – Profile Comparison

Table 4-1. Comparison of Channel Modification Alternatives

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5	ALTERNATIVE 6	ALTERNATIVE 7	ALTERNATIVE 8
1. General Description	No measures taken to meet the Collaborative objectives of providing flood and erosion protection for Adobe Creek Upper Reach 5.	An excavated 17-foot wide low flow channel; a 10 foot wide bench on both sides of the low flow channel; 1:1 bank slopes above the bench on both sides for 700 feet downstream of the West Edith Avenue Bridge; step-pools evenly spaced along the channel bottom.	An excavated 16-foot wide low flow channel; an 9 foot wide bench on both sides of the low flow channel; less than 1:1 bank slopes above the bench on both sides for 700 feet downstream of the West Edith Avenue Bridge; step-pools evenly spaced along the channel bottom.	An excavated 16-foot wide low flow channel; a 9-foot wide bench on both sides of the low flow channel; less than 1:1 bank slopes above the bench on both sides for 700 feet downstream of the West Edith Avenue Bridge; step-pools would begin 500 feet downstream of the West Edith Avenue Bridge and continue for 200 feet downstream.	An excavated rock riprap-lined channel with a 10-foot wide bottom width; a 40-foot to 50-foot top width for 700 feet downstream of the West Edith Avenue Bridge; step-pools would be evenly spaced along the channel bottom.	An excavated 16-foot wide low flow channel; a 9-foot wide bench on both sides of the low flow channel; less than 1:1 bank slopes above the bench on both sides for 700 feet downstream of the West Edith Avenue Bridge; retaining walls along the channel banks at some locations to minimize the channel top width; step-pools evenly spaced along the channel bottom.	An excavated 15-foot wide low flow channel; an 8-foot wide bench on both sides of the low flow channel; truncated channel cross section above the bench on Los Altos creekside for 700 feet downstream of the West Edith Avenue Bridge; less than 1:1 bank slopes above the bench on Los Altos Hills creekside for 700 feet downstream of the West Edith Avenue Bridge; step-pools evenly spaced along the channel bottom; additional right of way provided at one location.	An excavated 15-foot wide low flow channel; an 8-foot wide bench on both sides of the low flow channel; truncated channel cross section above the bench on Los Altos creekside for 700 feet downstream of the West Edith Avenue Bridge; less than 1:1 bank slopes above the bench on Los Altos Hills creekside for 700 feet downstream of the West Edith Avenue Bridge; step-pools would begin 500 feet downstream of the West Edith Avenue Bridge and continue for 200 feet downstream; additional right of way provided at one location.
Right-of-way Criterion	None required	Exceeds blue line limits along the channel	Exceeds blue line limits at some locations along the channel	Exceeds blue line limits at some locations along the channel	Does not exceed right of way limits	Does not exceed right of way limits	*Exceeds right of way limit at 1 locations along the channel	*Exceeds right of way limit at 1 locations along the channel
Vegetation Criterion	None impacted	Impacts to mature redwood trees along the Los Altos creek bank.	Impacts to mature redwood trees along the Los Altos creek bank.	Impacts to mature redwood trees along the Los Altos creek bank.	No impacts to mature redwood trees along the Los Altos creek bank.	No impacts to mature redwood trees along the Los Altos creek bank.	No impacts to mature redwood trees along the Los Altos creek bank.	No impacts to mature redwood trees along the Los Altos creek bank.
Channel Capacity Criterion	500 cfs	1,400 cfs	1,000 cfs	750 cfs	900 cfs	900 cfs	1,000 cfs	1,100 cfs
Impacts of Mitigation	None	Low	Low	Low	High	High	Low	Low
Public Acceptance	Low	Low	Low	Low	High	High	High	High
Channel Invert Stability	Low	High	Low	Low	High	Low	Low	High
Channel Cross section configuration	Low	High	Medium	Medium	Low	Low	Medium	Medium
Collaborative Evaluation	Not acceptable to the Collaborative because of continued channel erosion.	Not acceptable to the Collaborative because the channel top width exceeded the right of way limits and the loss of some trees identified by the Collaborative as "tree of particular value."	Not acceptable to the Collaborative because the channel top width exceeded the right of way limits and the loss of some trees identified by the Collaborative as "tree of particular value."	Not acceptable to the Collaborative because the channel top width exceeded the right of way limits and the loss of some trees identified by the Collaborative as "tree of particular value."	Not acceptable to the Collaborative because of the potential mitigation associated with the quantity of rock riprap lining proposed for this alternative.	Not acceptable to the Collaborative because of the potential mitigation associated with the amount of retaining walls proposed for this alternative.	Not acceptable to the Collaborative because this alternative would have a high potential for channel erosion.	Acceptable to the Collaborative.

*Additional right of way provided by resident at one location

4.2 EROSION REPAIR PROJECT ELEMENTS

The erosion repair project elements consist of erosion repair work downstream of the Robleda storm drain. The Collaborative identified four erosion sites and channel bottom erosion for the project. The description of these erosion sites are as follows:

- Erosion Site 1 – The channel bank consists of a deteriorating wood retaining wall on the Los Altos creekside (Van Horne property) and the channel bottom at this location is degraded. The wood retaining wall foundation is undercut (see Photo 6).

- Erosion Site 2 – The channel bank consists of incised bank below hanging vegetation which is located downstream of existing sacked concrete slope protection on the Los Altos creekside (Van Horne property). Undercutting is occurring underneath the sacked concrete slope protection (see Photo 7).

- Erosion Site 3 – The channel bank was eroded over 16 years ago on the Los Altos creekside (Robinwood Pool property), which resulted in the loss of soil on the upper portion of the bank. The existing bank of covered with a mix of vegetation and sacked concrete slope protection (see Photo 8).

- Erosion Site 4 – The channel bank consists of incised bank below hanging vegetation which is located downstream of existing gunite slope protection on the Los Altos creekside (Remmel property). Undercutting is occurring underneath and behind the gunite slope protection (see Photo 9).

- Channel Bottom Erosion – The incised channel downstream of the Robleda storm drain outlet has an eroded channel bottom downstream of an existing concrete weir in the channel (Moos property). Erosion activities over the years have formed a 4-foot drop downstream of the weir (see Photo 10). Channel bottom erosion in this location has also exposed foundations of the gunite and sacked concrete slope protection along the channel banks.

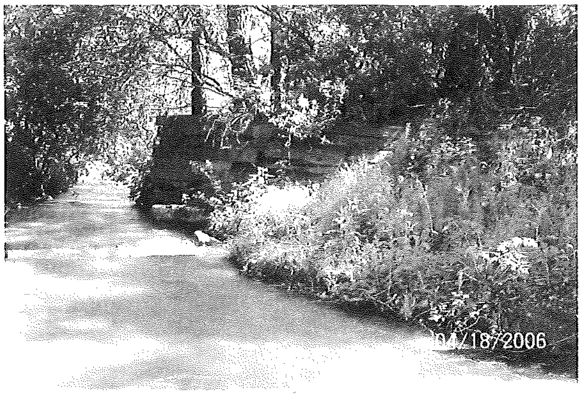


Photo 6. Degrading wood retaining on the Los Altos creekside and channel bottom erosion.

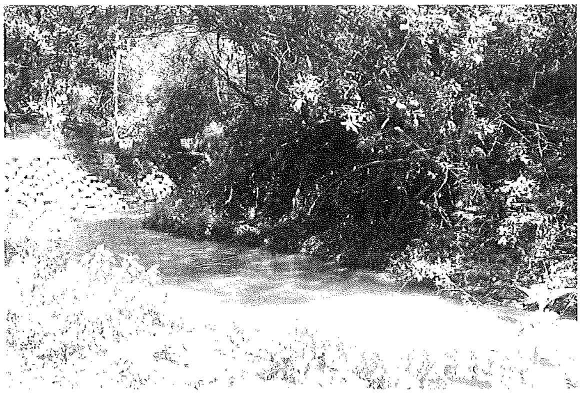


Photo 7. Incised exposed bank below hanging vegetation downstream of existing sacked concrete slope protection on the Los Altos creekside.

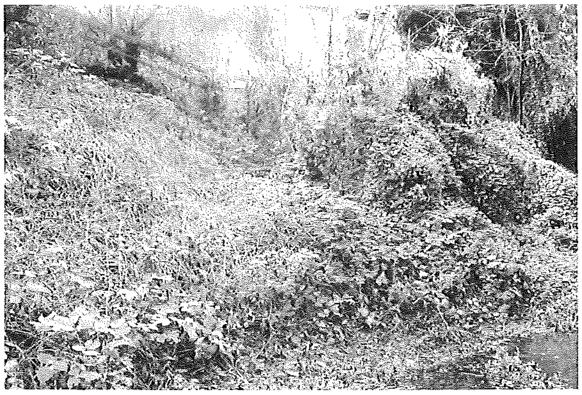


Photo 8. Previously eroded channel bank covered with a mix of vegetation and sacked concrete slope protection.

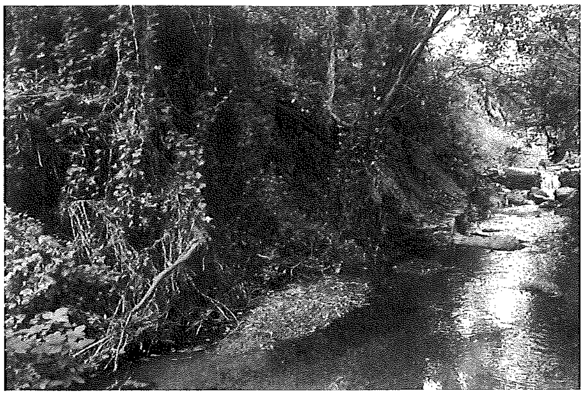


Photo 9. Incised bank below hanging vegetation downstream of existing gunite slope protection on the Los Altos creekside.

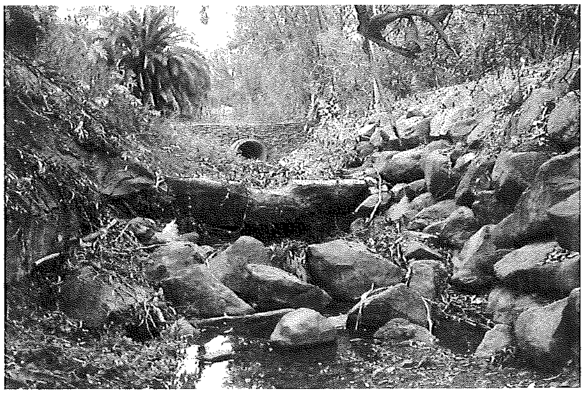


Photo 10. Eroded channel bottom downstream of an existing concrete weir in the channel (Robleda storm drain outlet in background).

In May 2005 staff developed four alternatives (Alternative A – D) for erosion repair downstream of the Robleda storm drain outlet. The alternatives considered for erosion repair ranged from the use of rock rip rap (Alternatives A and B) to the use of concrete retaining walls (Alternatives C and D) along the Los Altos creek bank. The rock riprap alternatives were acceptable to the Collaborative but the retaining wall alternatives were not acceptable to the Collaborative due to the habitat impacts to the stream channel, visual impacts, and mitigation impacts associated with the use of the retaining walls.

Alternative B was selected by the residents for erosion repair work downstream of the Robleda storm drain outlet. This alternative consists of four erosion sites and addresses channel bottom degradation. The proposed repair includes rock riprap slope protection placed at a 1–½:1 bank slope at the four erosion repair locations, up to the height of the one-percent water surface elevation (approximately 12 feet). Channel bottom degradation is addressed by installing step-pools to eliminate the 4-foot drop created by the existing concrete weir in the channel. All step-pools are designed to be "fish passable."

In November 2005, staff consulted with the resource agencies regarding the proposed erosion repair alternatives. Resource agencies expressed a desire to minimize the amount of hardscape and indicated concern about the height of the rock riprap for the proposed erosion repair, the amount of rock riprap proposed for erosion repair, and the severity of the erosion sites. During this period, the Collaborative discussed concern about the impact of the step-pools to the water surface elevation and stability of the creek bank along the Los Altos Hills creekside.

In March 2006 staff held a workshop with residents to evaluate proposed erosion repair project elements downstream of the Robleda storm drain outlet. At the workshop staff presented erosion elements aimed at minimizing the height and amount of hardscape and address residents concerns regarding the impacts of the step-pools. The erosion repair project elements were developed following the review of geotechnical data of the creek bank, HEC-RAS modeling results, and field visits to further evaluate existing conditions. The erosion repair project elements included variations for the placement of the step-pools to the installation of an energy dissipation structure downstream of the existing concrete weir in the channel, toe protection, and options for bank erosion repair along the channel. Staff held additional meetings in May 2006 with representatives of the Robinwood Pool Association to finalize proposed erosion repair elements along the Robinwood Pool property bank.

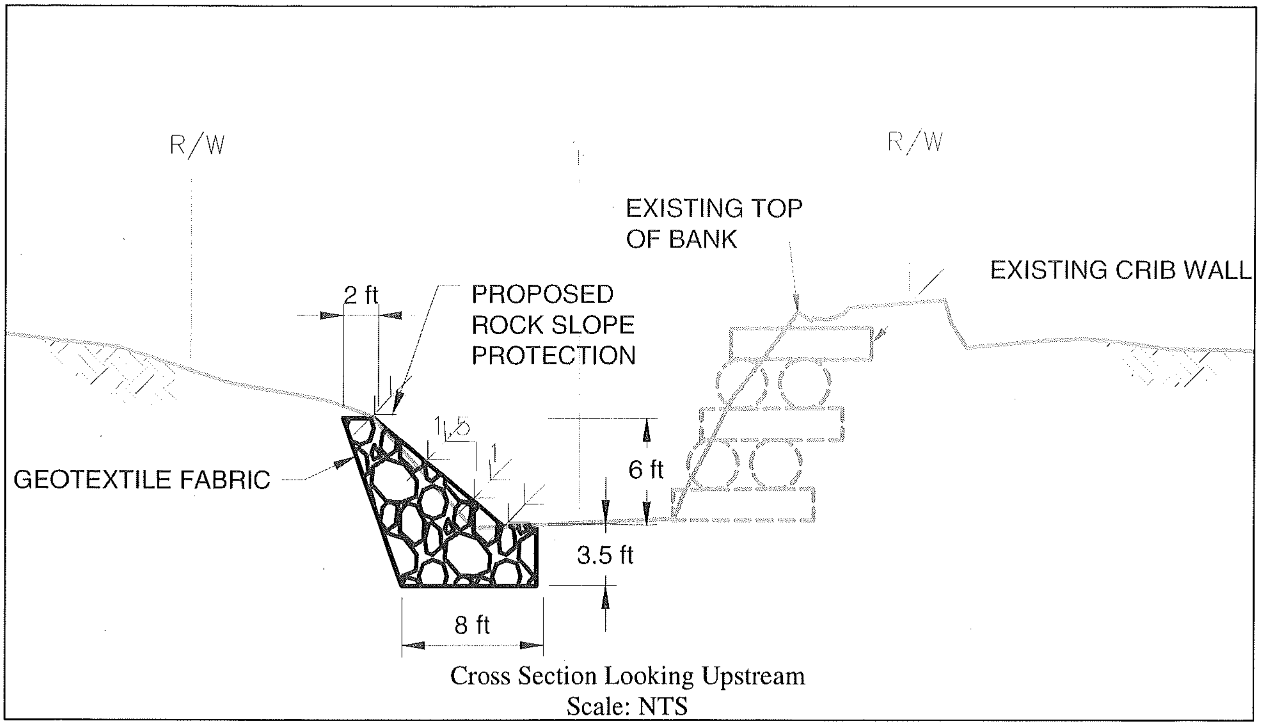
The finalized erosion repair project elements developed by the Collaborative consist of:

- Stabilizing the channel invert with "fish passable" step-pools along the channel bottom;
- Rock at the channel toe 3 feet up the bank along exposed banks;
- Rock riprap slope protection at 3 erosion sites placed at a 1–½:1 bank slope up to the ten-percent water surface elevation instead of the one-percent water surface elevation;
- Reinforcement of existing cutoff walls at the toe of existing sacked concrete slope protection along the channel banks.

The erosion repair sites and erosion repair project elements are summarized in Table 4-2.

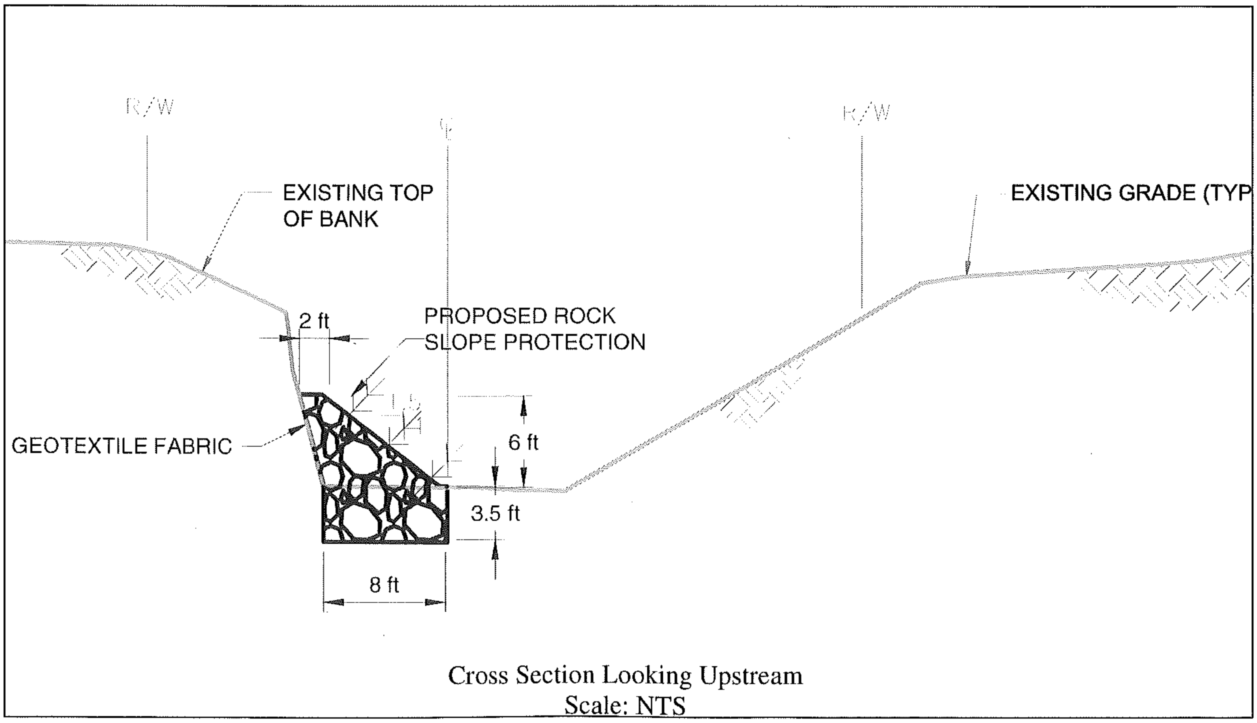
Table 4-2. Summary Table of Erosion Repair Sites and Project Element

Creek Station	Description	Erosion Repair Project Element
1+000 to 1+011 (see Figure 4-9)	Channel bank consists of a degrading wood retaining on the Los Altos creekside and the channel bottom at this location is eroded. Van Horne and Niermann residence.	Rock riprap slope protection placed at a 1–½:1 bank slope up to the 10-yr water surface elevation. Cuttings will be installed within spaces between the rocks
1+000 to 1+020	Existing log cribwall on the Los Altos Hills creekside is being undercut behind the logs. Ward residence.	Replant existing log cribwall.
1+028 to 1+038 (see Figure 4-10)	Channel bank consists of incised exposed bank below hanging vegetation downstream of existing sacked concrete slope protection on the Los Altos creekside. Van Horne residence.	Rock riprap slope protection placed at a 1–½:1 bank slope up to the 10-yr water surface elevation. Cuttings will be installed within spaces between the rocks.
1+038 to 1+064	Existing sacked concrete slope protection on Los Altos creekside. Channel bottom erosion impacts the sacked concrete slope protection cutoff wall. Van Horne Residence.	Reinforcement of existing cutoff walls at the toe of existing sacked concrete slope protection.
1+052 to 1+068 (see Figure 4-11)	Channel bank covered with a mix of vegetation and sacked concrete slope protection on Los Altos creekside. Channel bottom is degrading. Robinwood Pool property.	Rock at the channel toe 3 feet up the bank, no cut into existing bank. Cuttings will be installed within spaces between the rocks
1+043 to 1+055	Exposed earth bank covered with grass on Los Altos Hills creekside. Moos residence.	Rock at the channel toe 3 feet up the bank, no cut into existing bank. Cuttings will be installed within spaces between the rocks
1+055 to 1+070	Existing sacked concrete slope protection on Los Altos Hills creekside. Channel bottom erosion impacts the sacked concrete slope protection cutoff wall. Moos residence.	Reinforcement of existing cutoff walls at the toe of existing sacked concrete slope protection.
1+056 to 1+095	Channel bottom degrading. 4-foot drop downstream on existing concrete weir forms a fish passage barrier.	Stabilizing the channel invert with "fish passable" step-pools along the channel bottom.
1+068 to 1+080 (see Figure 4-12)	Channel bank consists of incised exposed bank below hanging vegetation downstream of existing gunite slope protection on the Los Altos creekside. Remmel residence and Robinwood Pool property.	Rock riprap slope protection placed at a 1–½:1 bank slope up to the 10-yr water surface elevation. Cuttings will be installed within spaces between the rocks
1+070 to 1+095 (see Figure 4-13)	Channel bank covered with a mix of vegetation on Los Altos Hills creekside. Toe is exposed earth, with roots, and trees at top of bank. Moos residence.	Rock at the channel toe 3 feet up the bank, no cut into existing bank. Cuttings will be installed within spaces between the rocks



Cross Section Looking Upstream
Scale: NTS

Figure 4-9. Erosion Repair Typical Section – Station 1+000 to 1+011



Cross Section Looking Upstream
Scale: NTS

Figure 4-10. Erosion Repair Typical Section – Station 1+028 to 1+038

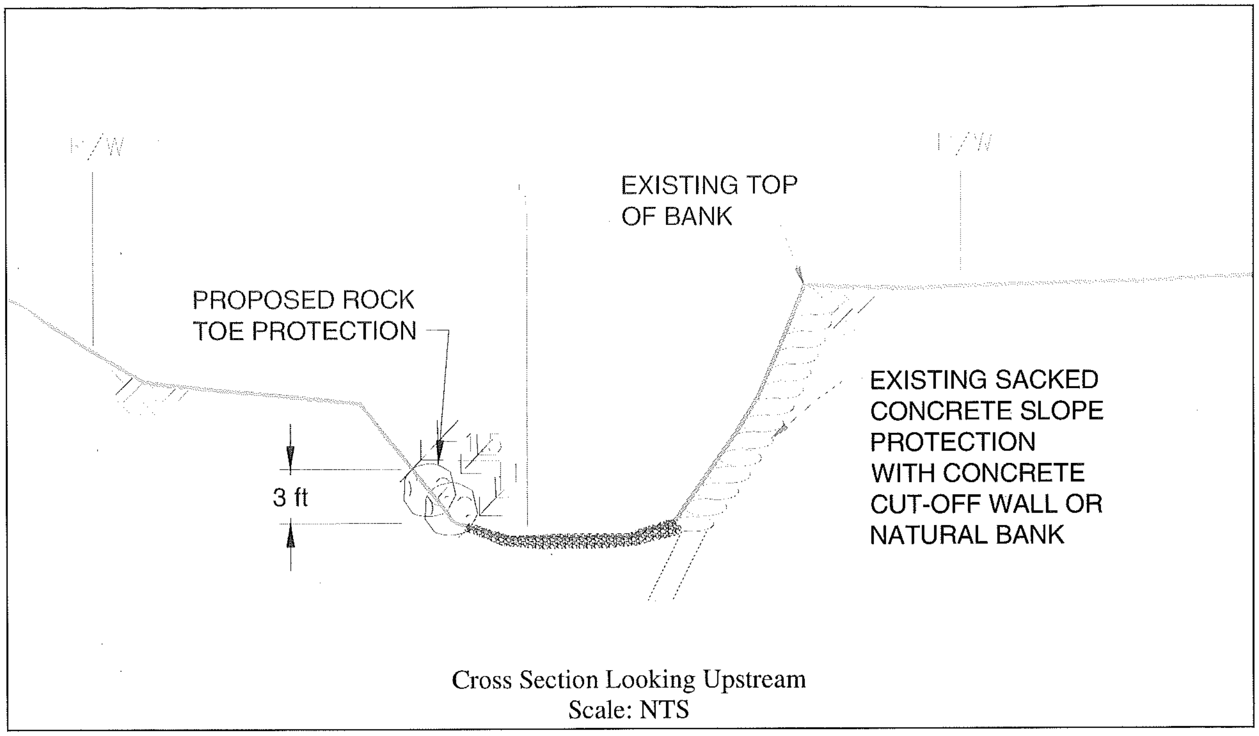

R/W
R/W
EXISTING TOP OF BANK
PROPOSED ROCK TOE PROTECTION
1.5
1
3 ft
EXISTING SACKED CONCRETE SLOPE PROTECTION WITH CONCRETE CUT-OFF WALL OR NATURAL BANK
Cross Section Looking Upstream
Scale: NTS

Figure 4-11. Erosion Repair Typical Section – Station 1+052 to 1+068

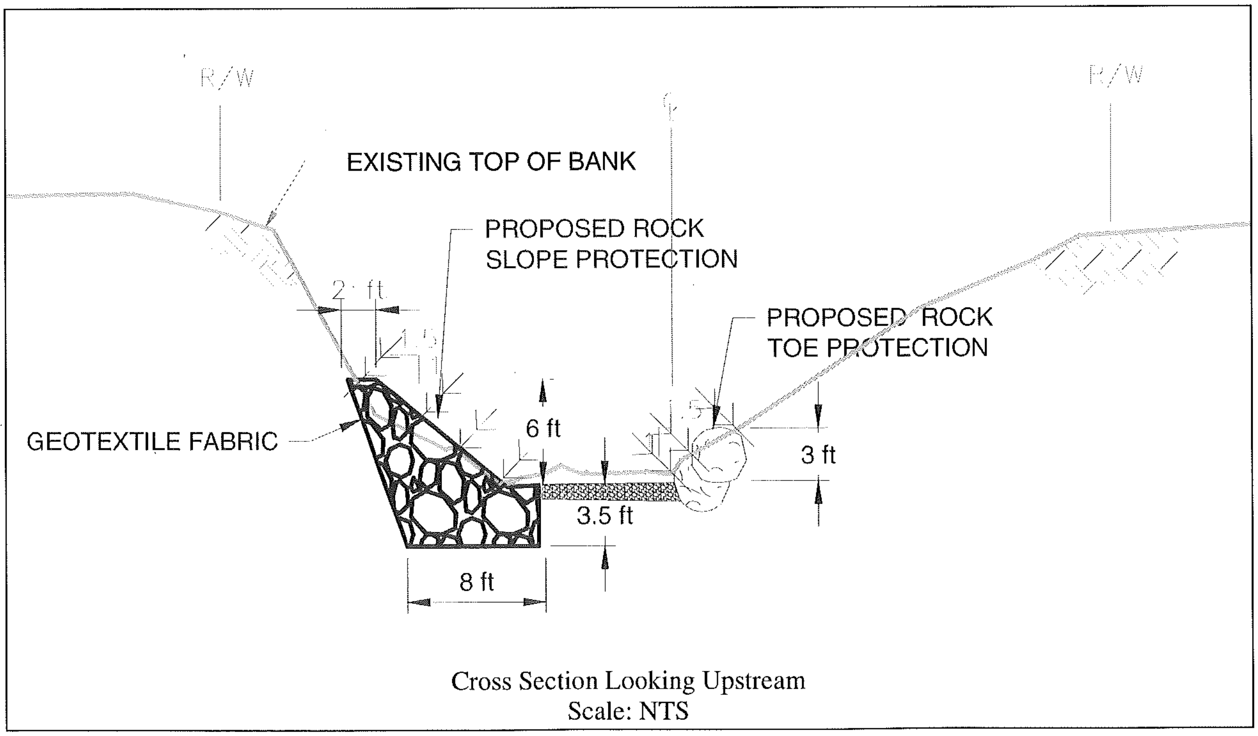
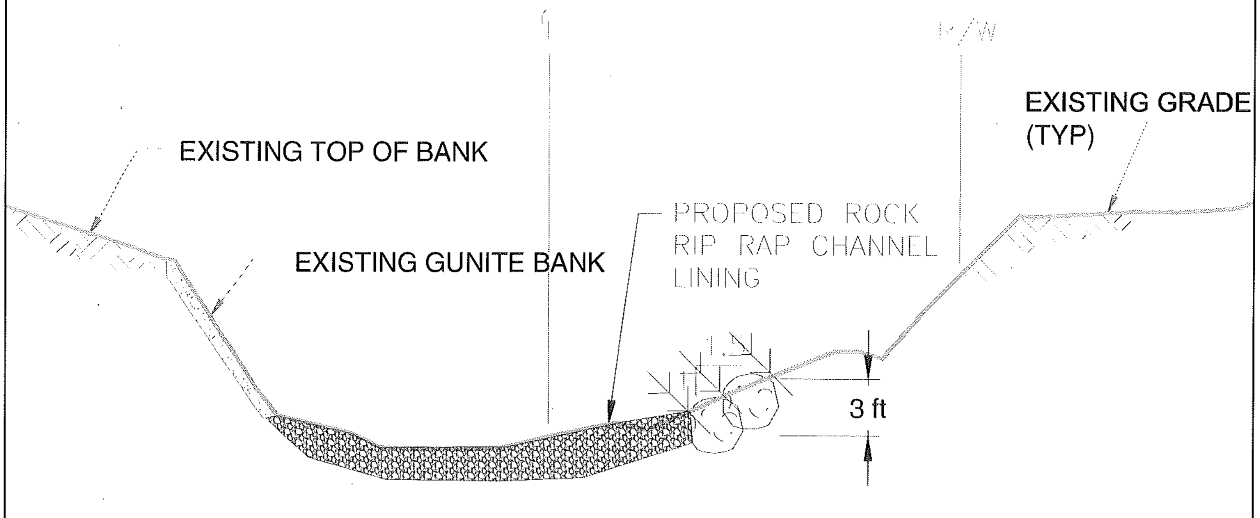

R/W
R/W
EXISTING TOP OF BANK
PROPOSED ROCK SLOPE PROTECTION
PROPOSED ROCK TOE PROTECTION
2 ft
1.5
1
6 ft
GEOTEXTILE FABRIC
1.5
1
3 ft
3.5 ft
8 ft
Cross Section Looking Upstream
Scale: NTS

Figure 4-12. Erosion Repair Typical Section – Station 1+068 to 1+080



Cross Section Looking Upstream
Scale: NTS

Figure 4-13. Erosion Repair Typical Section – Station 1+070 to 1+095

Chapter 5. Description of the Preferred Project Alternative

5.1 INTRODUCTION

Based on a comparison and evaluation of the project alternatives by the Collaborative, Alternative 8 is recommended as the preferred project alternative for Channel Modifications, and the erosion repair project elements developed by the Collaborative (Attachment B).

A Supplemental Environmental Impact Report (SEIR) will be prepared to supplement the May 1999 Final Environmental Impact Report for the Adobe Creek Watershed Planning Study.

The proposed measures for channel modification include:

- An excavated low flow channel approximately 15 feet wide, with a bench on both sides of the low flow channel, approximately 8 feet wide. The channel cross section will be cutoff above the bench on the Los Altos side of the creek for 700 feet downstream of the West Edith Avenue Bridge, since minimal modifications will be done to that bank. Channel banks will be sloped at 2:1 or flatter above the bench on the Los Altos Hills side of the creek for 700 feet downstream of the West Edith Avenue Bridge, except for two locations along the channel;
- A series of "fish passable" step-pools beginning 500 feet downstream of the West Edith Avenue Bridge and continue downstream for 200 feet;
- Grading the channel invert to remove accumulated sediment from underneath the West Edith Avenue Bridge;
- Replacing an existing concrete wing wall downstream of the West Edith Avenue Bridge on the Los Altos Hills creekside to eliminate a constriction;
- Extending the existing wing wall downstream on the West Edith Avenue Bridge on the Los Altos creekside;
- Filling and planting a portion of the existing channel outside of the proposed channel alignment;
- Modification of the Robleda storm drain outlet, and revegetation of the project area.

The erosion repair project elements downstream of the Robleda storm drain include:

- Replacing an existing 4 foot drop structure with "fish passable" step-pools;
- Protecting the eroded channel toe with 3 feet rock protection;
- Protecting eroded channel banks with rock slope protection up to the ten-percent water surface elevation;
- Reinforcing the existing cutoff walls at the toe of existing sacked concrete slope protection;

- Replanting of the existing log cribwall along the Los Altos Hills bank.

All step-pools will be constructed in two stages. In the first stage the channel will be cleared of vegetation, and enough of the bank and creek bed would be excavated to "key" in the rock when it is placed. The second stage is the placement of the rock. During this stage a loader would bring in the rock and a hydraulic excavator would place it. All step pool lengths will be 43 feet and the drop heights will range between 1 to 2 feet. The step pools have been developed to accommodate the fish passage criterion for the Sacramento sucker.

All rock riprap for the project, which includes channel invert, bank protection, and step pools, will be sized using design manuals from the U. S. Army Corps of Engineers and the California Department of Transportation.

Due to the incised nature of the channel downstream of the Robleda storm drain, staff recognizes that there may be a potential for downgrading of the channel invert in this reach; hence, additional monitoring and maintenance will be required for the proposed erosion repair elements. Also, existing gunite slope protection along the channel banks will be evaluated and repaired as needed.

Earthen channel banks less than 2:1 are subject to higher erosion risk; hence, the project will use erosion control fabric and vegetation to manage erosion at locations with channel banks steeper than 2:1.

Channel improvements will require tree removal on the Los Altos Hills side of the creek, which has been coordinated with the Collaborative and agreed to by the property owners. Two trees on the Los Hills side of the creek have been identified as good candidates for transplanting. Tree removal on the Los Altos side of the creek will be limited to the trees shown on the plans for this project. Revegetation areas for the project will be planted with plant species which will provide both aesthetic and habitat restoration. Aesthetic restoration will consist of large trees planted to restore the screening provided by the existing vegetation. Habitat restoration will be addressed in the mitigation plan for the project and covered in the project SEIR.

The possible staging area for construction are proposed on the project site along the Los Altos Hills bank and upstream of West Edith Avenue in the Town of Los Altos Hills park. Access to the construction area is proposed to be from West Edith Avenue, Fremont Road, and Seven Acres Lane.

5.2 RIGHT-OF-WAY REQUIREMENTS

The easements for the project footprint have been granted by the creekside property owners. Temporary construction easements for site access and staging will be needed at APN 175-25-068, APN 175-25-067, APN 175-10-003 and APN 175-10-015.

5.3 POTENTIAL PROJECT IMPACTS

Traffic Impacts – Construction of the project will affect traffic in the short term due to heavy haul trucks used to transport material to and from the project site, contractor cueing, and employee parking. The access of construction vehicles onto the project site may result in traffic impacts on the nearby streets at West Edith Avenue and Fremont Road. A permit will be required from the Town of Los Altos Hills. Staff will work with the Town of Los Altos Hills to develop a traffic control plan during the design phase for implementation during construction.

Utility Conflicts – Existing utilities within the project area include a sanitary sewer line crossing the creek upstream of the West Edith Avenue Bridge, an underground telephone line crossing the creek at the West Edith Avenue Bridge, an overhead electrical line near the Robleda storm drain outlet, and the Robleda storm drain outlet downstream of the West Edith Avenue Bridge.

The sanitary sewer line is owned by the Town of Los Altos Hills. This facility will be protected in place during construction. The contractor will be required to expose the top of the sewer encasement prior to grading.

The underground telephone line is owned by AT&T and will be protected in place during construction. The contractor will be required to expose the top of the telephone encasement prior to grading.

The Robleda storm drain is owned by the Town of Los Altos Hills. Staff will work with the Town of Los Altos Hills during the design phase to ensure the proper design of the modified outlet for the storm drain.

The overhead electrical facility is owned by PG&E. This facility will be protected in place. The power pole on the Los Altos Hills bank may require reinforcement during construction activities.

Vegetation Impacts – Construction activities will impact existing vegetation along the channel. Vegetation to be saved along the Los Altos and Los Altos Hills creek bank will be protected using preservation fencing. Details on the vegetation to be saved during construction will be available in the project plans. All vegetation on the Los Altos side of the creek will be saved except for those identified in the plans for the project.

Water Quality Impacts – Construction activities may impact the water quality downstream of the project sites. The creek is expected to be dry during the construction period; however, incidental water may exist on the project site due to groundwater seepage. Incidental water may also reach the project site through local storm drains. Water flowing in the creek during the channel construction will be blocked and diverted around the construction area using pumps and pipes.

Other Impacts – Additional project impacts may include noise, dust, vibration, and temporary loss of some space at Edith Park. These impacts are addressed in the Supplemental Environmental Impact Report for the project.

5.4 CONSTRUCTION MONITORING

Detailed plans and contract specifications will be developed by staff, and District inspectors will oversee implementation to ensure compliance to the specifications. The plans and specifications developed for the project will include detailed information on the proposed project elements, including project staging and access points.

5.5 OPERATION AND MAINTENANCE

The project incorporates a short-term and long-term maintenance plan, designed to ensure that the restored habitat is successful and that the channel conveyance capacity and erosion repair project elements are maintained.

Short-term Maintenance Plan

During the first three years after construction, the contractor's maintenance activities will include: weed control, irrigation maintenance, supplemental watering, replacement planting, and reseeding. At the end of the 3-year maintenance period, the District will inspect the project site to see if the plants are growing properly.

Long-term Maintenance Plan

The Project is designed to require little long-term maintenance. However, some activities may be necessary to ensure that the flood conveyance capacity of the Project reach and erosion repair features are maintained. Maintenance activities required for the project will be performed under the District's Stream Maintenance Program.

Due to limited access through this reach, routine maintenance work will be conducted primarily from the channel bottom, using temporary access ramps. The work, therefore must be done during the late summer or early fall when the creek is dry. Maintenance activities may involve removal of large debris and fallen trees obstructing flow, construction and repair of erosion protection measures, removal of excessive vegetation and sediment in the waterway.

Chapter 6. Project Cost, Financing, and Schedule

6.1 COST

The estimated construction cost for the Project is $2.5 million. There are no anticipated right-of-way acquisition costs.

Table 5-1. Estimated Project Construction Cost

PREFERRED ALTERNATIVE PROJECT ESTIMATED CONSTRUCTION COSTS				
ITEM	UNIT PRICE	UNIT	QUANTITY	AMOUNT
I. CONTROL OF WATER	$95,347	LS	1	$95,347
II. TEMPORARY ACCESS ROAD	$2,712	LS	1	$2,712
III. SWPPP AND BMP COMPLIANCE	$45,000	LS	1	$45,000
IV. ECOLOGICAL SERVICES	$17,120	LS	1	$17,120
V. CLEARING AND GRUBBING	$42,394	LS	1	$42,394
VI. SITE DEMOLITION	$65,028	LS	1	$65,028
VII. CHANNEL CONSTRUCTION				
Channel Excavation	$73	CM	3,380	$247,966
Channel Embankment	$35	CM	790	$28,036
Streambed Fill	$42	CM	296	$12,529
VIII. STORM DRAIN MODIFICATION	$1,736	LS	1	$1,736
IX. STEP POOL CONSTRUCTION				
Boulder Placement	$83	TON	1,080	$89,660
Filter Fabric	$2	SM	1,109	$2,670
X. WINGWALL CONSTRUCTION	$33,068	LS	1	$33,068
XI. EROSION REPAIR				
Rock slope protection	$240	CM	1,280	$307,223
Channel toe protection	$240	CM	501	$120,168
XII. SITE RESTORATION				
Irrigation	$56,206	LS	1	$56,206
Erosion control fabric	$2	SM	2,021	$3,065
Hydroseeding	$2	SM	2,021	$4,134
Mature tree planting	$300	EA	75	$22,500
Container planting	$22	EA	150	$3,291
Tree transplanting	$309	EA	2	$618
Plant maintenance	$2,000	MO	36	$72,000
Irrigation system maintenance	$4,000	MO	12	$48,000
XIII. DISPOSAL	$195,385	LS	1	$195,385
XIV. EXTRA WORK	$303,171	LS	1	$303,171
SUBTOTAL				$1,819,029
MOBILIZATION AND DEMOBILIZATION (10%)				$181,903
CONTINGENCY (30%)				$545,709
TOTAL CONSTRUCTION COSTS				$2,500,000

6.2 FUNDING

The project will be funded by the Lower Peninsula Watershed Fund.

6.3 PROJECT ACTIVITIES AND SCHEDULE

Advertising for bids is expected to begin in January 2008. Contract award is anticipated in early April 2008. Construction is scheduled to begin in June 2008, with an expected completion date of December 2008. A 3 year plant maintenance period will follow at the end of the construction.

The proposed overall project schedule is presented in Table 5-2:

Table 5-2. Preliminary Project Schedule

Project Phase Element	Proposed Completion Date
Planning	July 2007
Design	December 2008
Contract Award	April 2008
Construction	December 2008
Plant Maintenance	December 2011

Chapter 7. Conclusions and Recommendations

The Santa Clara Valley Water District is proposing to perform channel improvements along Adobe Creek from the West Edith Avenue Bridge to 1,100 feet downstream, referred to as Adobe Creek Upper Reach 5.

The recommended project consists of two sections: channel improvements begin just upstream of the West Edith Avenue Bridge and extend approximately 700 lineal feet to the Robleda Storm drain outlet. Erosion repair work would continue downstream of the Robleda storm drain outlet.

The recommended channel improvement for the project consists of an excavated low flow channel approximately 15 feet wide; with a bench on both sides of the low flow channel, approximately 8 feet wide. The channel cross section is cut off above the bench on the Los Altos side of the creek for 700 feet downstream of the West Edith Avenue Bridge. Channel banks are sloped at less than 1:1 above the bench on the Los Altos Hills side of the creek for 700 feet downstream of the West Edith Avenue Bridge. The proposed measures will include step-pools which will begin 500 feet downstream of the West Edith Avenue Bridge and continue for 200 feet downstream. Construction will include: sediment removal underneath the West Edith Avenue Bridge, modification of an existing concrete wing wall downstream of the West Edith Avenue Bridge, filling and planting a portion of the existing channel that outside of the realigned proposed channel, modification of the Robleda storm drain outlet, and revegetation of the project area.

The recommended erosion repair work consist of replacing an existing 4 foot drop structure with "fish passable" step-pools, protecting a section of an eroded channel toe with 3 feet rock protection, protecting eroded channel banks with rock slope protection up to the ten-percent water surface elevation, and reinforcing the existing cutoff walls at the toe of existing sacked concrete slope protection. Construction will include replanting of the existing log cribwall along the Los Altos Hills bank.

The map and general plans for the recommended project are contained in Attachment C of this report.

The recommended project alternative supports District Board Policy E-2.2: *There is reduced potential for flood damages*; and District Board Policy E-3.1: *Watersheds, streams and natural resources therein are protected and when appropriate, enhanced or restored.*

Staff recommends approval of the preferred project alternative so that construction plans can be prepared for its implementation.

Chapter 8. References

Adobe Creek Upper Reach 5 Restoration Project Collaborative Principles, September 2004.

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California Building Code, California Building Standards Commission, Sacramento, Calif., 2002.

Henderson, F. M., *Open Channel Flow*, The Macmillan Company, New York, 1966.

Hydraulic Design Criteria, U. S. Army Corps of Engineers, Washington, D. C., 1987.

Hydraulic Design of Flood Control Channels, U. S. Army Corps of Engineers, Washington, D. C., 1994.

Minimum Design Loads for Buildings and Other Structures, American Society of Civil Engineers, Reston, Virginia, 2003.

Racin, James A., Thomas P. Hoover, and Catherine M. Crossett Avila, *California Bank and Shore Rock Slope Protection Design*, California Department of Transportation, Sacramento California, 1996.

SCVWD. March 1995, *Report on Flooding and Flood Related Damages in Santa Clara County January and March 1995*, Santa Clara Valley Water District, San Jose California, 1995.

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SCVWD, *Memorandum, Adobe Creek Fisheries*, Santa Clara Valley Water District, San Jose, California, 2006.

SCVWD. *Hydraulic Design Manual*, Santa Clara Valley Water District, San Jose, Calif., 2006.

SCVWD. *Memorandum, Adobe Creek Geomorphic Study*, Santa Clara Valley Water District, San Jose, California, 2005.

SCVWD. *Adobe Creek Reaches 5 & 6 Hydrology Report*, Santa Clara Valley Water District, San Jose, California, 2005.

ATTACHMENT A

Adobe Creek Reaches 5 and 6 Hydrology Report

Adobe Creek Reaches 5 & 6

Hydrology Report

Prepared by

James Wang, PhD, PE
Engineering Unit Manager

Wendy Chang, PE
Associate Civil Engineer

Nahm Lee
Assistant Engineer II

Santa Clara Valley Water District

February, 2005

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Figure 3	Adobe Creek Reaches 5&6 Parcel Map with Watershed Sub-basin Boundaries
Figure 4	Adobe Creek Reaches 5&6 Detailed Hydrology for 1% 1(100-yr) Event
Figure 5	Adobe Creek Reaches 5&6 Flood Frequency at Various Locations

1. INTRODUCTION

Adobe Creek originates in the northeasterly slopes of the Santa Cruz Mountains near Monte Bello Ridge. It drains 10 square miles and flows 14.7 miles from the Town of Los Altos Hills through the cities of Los Altos, Mountain View and Palo Alto before combining with Barron Creek. The Adobe-Barron Creek flow then enters the Palo Alto Flood Basin and subsequently flows into San Francisco Bay.

Adobe Creek Reach 5 extends from downstream of Foothill Expressway to downstream of West Edith Avenue for a total length of 2,270 feet, while Reach 6 extends from downstream of West Edith Avenue to downstream of Burke Road for a total distance of 2,335 feet.

1.1 Purpose of the Study

The main objective for this hydrology study is to develop the one percent and ten percent flow rates for Adobe Creek Reaches 5 & 6 using the District's updated hydrology procedures. The following catch points along Adobe Creek Reaches 5 & 6 were selected to calculate the one percent and ten percent peak flows for subsequent hydraulic analyses using a two-dimensional flow model:

- Adobe Creek at Burke Road
- Adobe Creek at Robinson's Property
- Adobe Creek at West Edith Ave. Bridge
- Adobe Creek at Astiz's Property
- Adobe Creek at Lippe's Property
- Adobe Creek at Foothill Expressway

1.2 Flood Control Hydrology

Hydrology is the study of the natural water cycle. The cycle begins with evaporation of water from the oceans and other bodies of water, continues with the formation of clouds and precipitation (rainfall), then transpiration through plants and their leaves, infiltration into the ground, runoff into streams, creeks and channels to the oceans, where the cycle begins again.

Flood protection hydrology mainly deals with the estimation of flood flows that can be generated from a watershed for a given frequency of occurrence. For example, in order to design a flood protection channel, engineers need to know the peak flow rate, which is the maximum rate of runoff, in the creek. The peak flow rate can be analyzed for any frequency of occurrence; the nationwide standard for flood protection design is the 100-year or 1% flood. A 1% flood has a 1/100th chance of being equaled to or exceeded in any one year.

2. PREVIOUS STUDY

In July of 1978, the Santa Clara Valley Water District (District) completed a study of the design flood flows which would be utilized in designing flood protection facilities within Santa Clara County. The study included the calculation of 1% and 10% design flood flows following the District's established method and procedures at the time.

The method in determining the design flood peaks and volumes utilized all available sources of information. It began with the use of Regional Regression Equations to compute peaks and volumes for rural areas. The values were also compared with the results obtained from a hydrologic rainfall-runoff model which is the HEC-1 Flood Hydrograph Package developed by the U.S. Army Corps of Engineers. Hydrographs were obtained from the model applying a 1% rainfall amount derived statistically from data at the nearby rainfall stations with the use of U. S. Army Corps of Engineers' 24-Hour Standard Project General Storm Precipitation Distribution for Northern California and the Clark Synthetic Unit Hydrograph technique. The peaks and volumes of these hydrographs were calibrated to be in close agreement with flood flow quantities derived from regional statistics. The flood hydrographs obtained this way were considered representative for use in the design of the flood protection facilities.

Based on the1978 hydrology study, the 1% flow rate in Adobe Creek at Foothill Expressway was about 2,700 cfs and the 10% flow rate was about 1,400 cfs.

3. UPDATED HYDROLOGY PROCEDURE

After the adoption of the District's hydrology procedures in the late 1970's, the USGS Office of Water Data Coordination changed its procedures in determining the flood flow frequencies of gaged data, which had been the basis for the development of the District's 1976 Regional Regression Equation. By the year 2000, with an additional 25 years of precipitation and stream flow data having been collected, the District believed it would be prudent to update the hydrology for Santa Clara County to keep up with current practices.

To update the District's hydrology procedures, comprehensive precipitation and stream flow data compilations and analyses were conducted. A new equation was developed to estimate the rainfall amount for those areas without rainfall gages. Similarly, with more historical stream flow data becoming available in Santa Clara County, a set of updated Regional Regression Equations was developed. The Regional Regression Equations for precipitation and streamflows are listed in Sections 1 and 2 of Appendix A.

4. HYDROLOGIC MODEL

The hydrologic model used for this study is the latest HEC-1 Flood Hydrograph Package (June, 1998). Details of the procedures described in the following sections can also be found in the District's publication entitled *Hydrology Procedures* (July 2004). The pertinent hydrologic modeling parameters and procedures in determining the design flow hydrographs are included in Appendix A.

4.1 Sub-Basin Boundaries

In addition to field observation, the following maps were used to delineate the watershed sub-basin boundaries.

1. Permanente Creek Flood Plain Map (June, 2004), Sheet 19 on Adobe Creek, developed by Aelytek Inc.. This map, with 0.5m contour lines as shown in Figure 1, was provided by the SCVWD Survey and Mapping Unit, and has been converted to a DEM (Digital Elevation Model) file.
2. Storm Drain Map from "DRAFT Town of Los Altos Hills Storm Drainage Master Plan (Oct, 2004)".
3. Santa Clara County Ortho Photos (2001)

The watershed sub-basin boundary delineation assumes that storm drains less than 24 inches in size will be full during both the 1% and 10% flood event, and the flow of water will follow the contour of the land. The watershed sub-basin boundaries are shown in Figures 2 and 3 with picture inserts showing certain hydrologic features.

Field observations indicate the following:

1. Sub-basin IR11 may not flow into sub-basin IR06 due to a barrier wall built by the resident. Thus, flow may follow the road draining to sub-basin IR10.
2. The flow direction for sub-basin IR14 will follow Fremont Road to sub-basin IR16, due to an existing retaining wall.
3. Sub-basin IR15 may flow over West Edith Avenue Bridge to sub-basin IR16, and then into Adobe Creek.

4.2 Design Storm Precipitation

Using the District's updated hydrology, the design storm precipitation has been developed and used to estimate the flood runoff magnitude. For this study, precipitation was obtained by data transpositioned from gaged locations to ungaged site and checked by using the global regional equation (Appendix A, Section 1.1) for reasonableness. For this study, the District's precipitation gages at Dahl Ranch (station #24), Maryknoll (station #53) and Mt. View Corp. Yard (station #121) were used for the data transposition. The resultant rainfall is 5.42 inches for a 24-hour, 1% event, and 3.98 inches for a 24-hour, 10% event.

5. ROBLEDA TRIBUTARY

The Robleda storm drain is a 60-inch diameter concrete pipe which was constructed in 1998 to relieve some of the local flooding. Its alignment is shown in Figure 2. This study assumes that the Robleda Tributary will carry all of the flows from sub-basin IR08 through IR14.

6. DESIGN FLOOD FLOWS

The design flows for this Adobe Creek Reaches 5 & 6 hydrology study are based on the 2004 updated hydrology procedure. After applying the hydrology procedure with precipitation, loss rates and routing parameters, the resulting flow rates are lower than the values obtained in 1978. Table 1 is a summary of the 1% and 10% flood flow rates at various catch points along Adobe Creek Reaches 5 and 6. The updated 1% flow rate at Foothill Expressway is 2,571 cfs and the 10% flow rate is 1,333 cfs. Figure 4 depicts the location of these calculated flow rates. Some detailed information on the parameters used for this study is included in Appendix B.

Table 1. Flow Rates at Selected Catch Points.

Catch Points	Basin Area	100-Year Peak Flow rate	10-Year Peak Flow rate
	square miles	cfs	cfs
Adobe Creek @ Burke Rd	6.48	2,390	1,243
Adobe Creek @ Robinson's Property	6.50	2,391	1,243
Adobe Creek @ Edith Ave. Bridge	6.53	2,397	1,245
Peak Flow into Robleda Trib.(IR08-12)	0.36	118	64
Peak Flow into Robleda Trib.(IR13 & 14)	0.02	7	4
Overland flow along Fremont Rd (IR05-07)	0.15	47	25
Overland flow above W. Edith Ave. Bridge(IR15)	2.8 Acres	2	1
Overland flow at the Park & Astiz's property (IR16)	3.3 Acres	2	1
Total overland flow at Astiz's property (IR15 & 16)	6.1 Acres	4	2
Adobe Creek @ Astiz's property	6.69	2,446	1,270
Adobe Creek @ Lippe's property	7.08	2,559	1,330
Adobe Creek @ Foothill Expressway	7.13	2,571	1,333

7. FLOOD FREQUENCY INFORMATION

The flood frequencies for Adobe Creek at various locations are listed in Table 2 with graphical presentation shown in Figure 5. The 1% and 10% peak flow rates are from HEC-1 rainfall-runoff modeling, while the remaining flows are interpolated and extrapolated by assuming a log-Pearson Type III distribution for various probabilities. These flow rates can be used for subsequent hydraulic analyses to better understand how flow behaves over the study reach.

Table 2. Flood Frequency at Various Locations

Probability (%)	Return Period (years)	Peak (cfs)			
		At Burke Road	At Edith Ave. Bridge	At Lippe's Property	At Foothill Expressway
0.2	500	3,160	3,170	3,380	3,400
0.5	200	2,730	2,730	2,920	2,930
1	100	2,390	2,397	2,559	2,571
2	50	2,050	2,060	2,190	2,200
4	25	1,700	1,710	1,820	1,830
5	20	1,590	1,600	1,700	1,710
10	10	1,243	1,245	1,330	1,333
20	5	895	895	955	960
40	2.5	545	545	580	580
43	2.33	510	510	540	540
50	2	430	430	460	460
66	1.5	280	280	300	300
90	1.1	110	110	115	115
99	1	30	30	30	30

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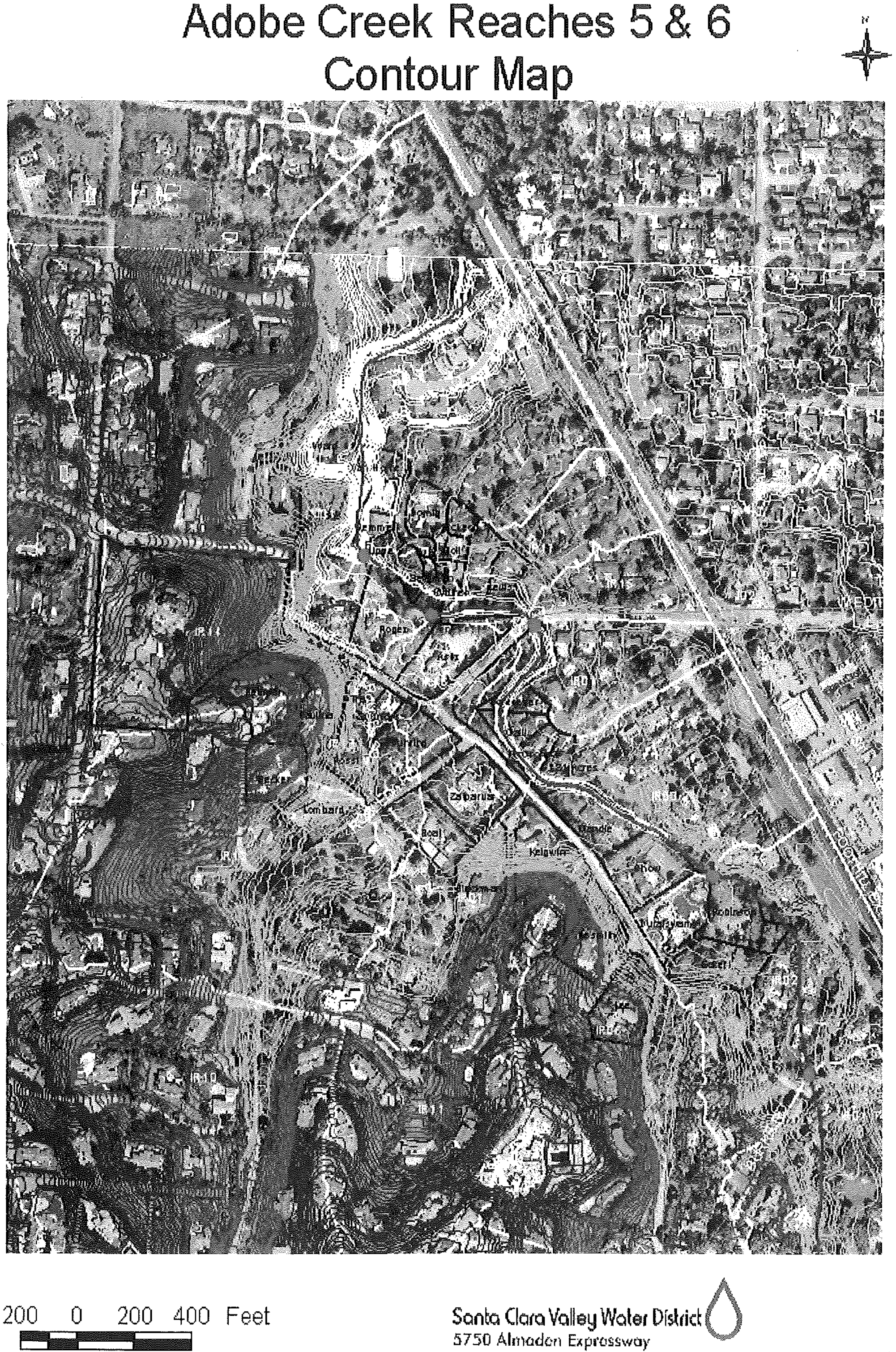
Adobe Creek Reaches 5 & 6
Contour Map



Santa Clara Valley Water District
5750 Almaden Expressway
San Jose, CA 95118-3686

February, 2005

Figure 1. Adobe Creek Reaches 5 & 6 Contour Map

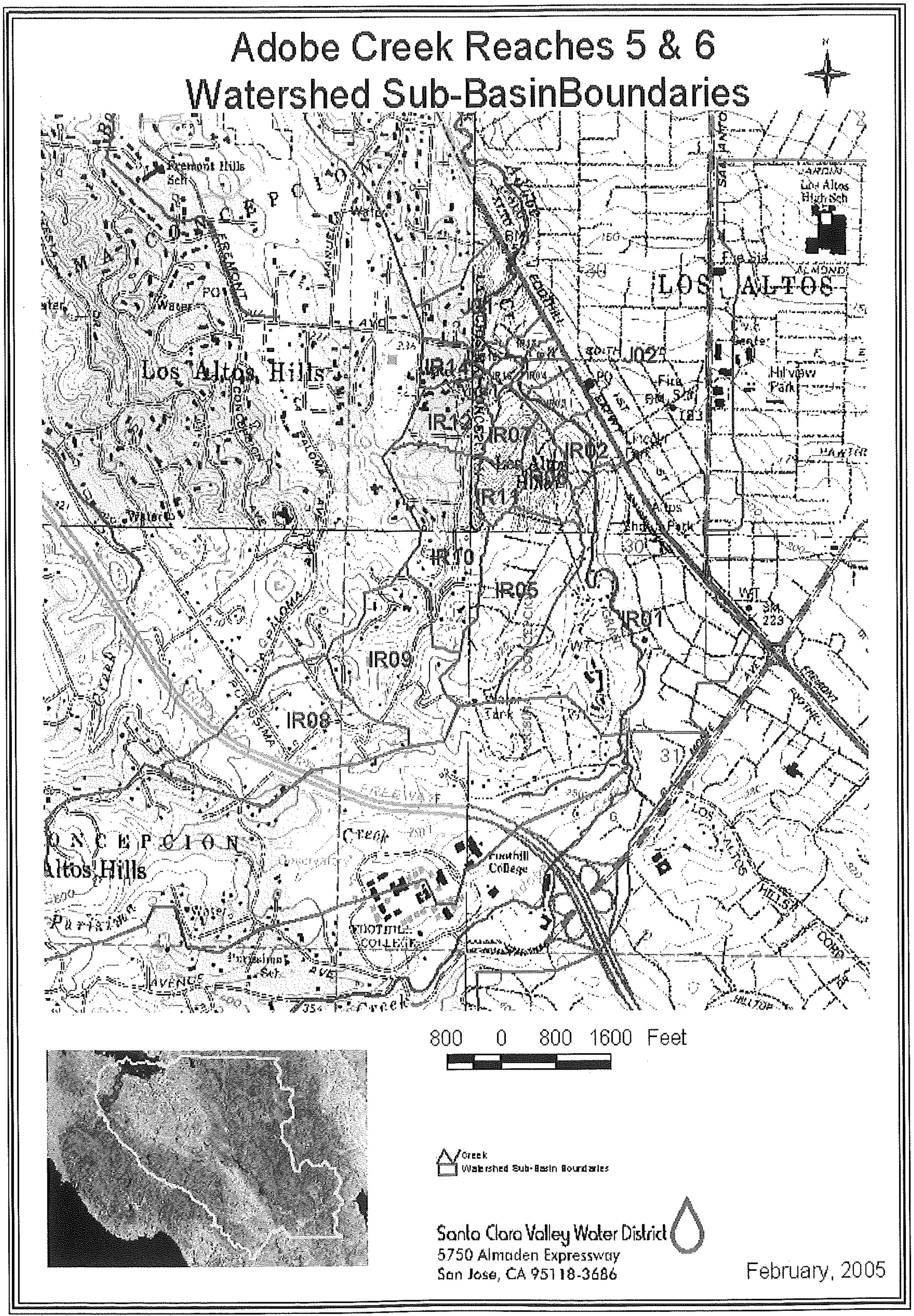


Figure 2. Adobe Creek Reaches 5 & 6 Watershed Sub-Basin Boundaries

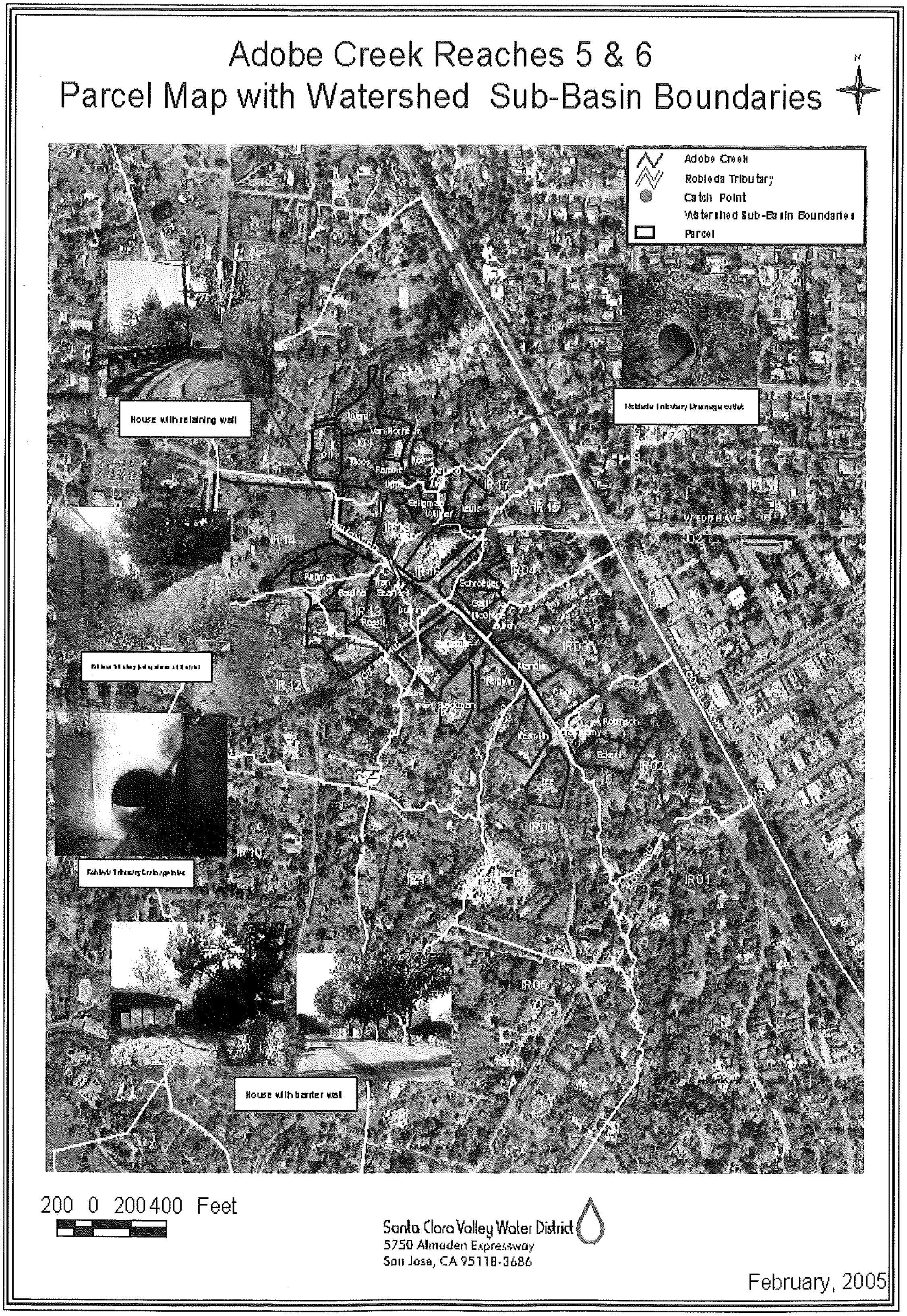


Figure 3. Adobe Creek Reaches 5 & 6 Parcel Map with Watershed Sub-Basin Boundaries

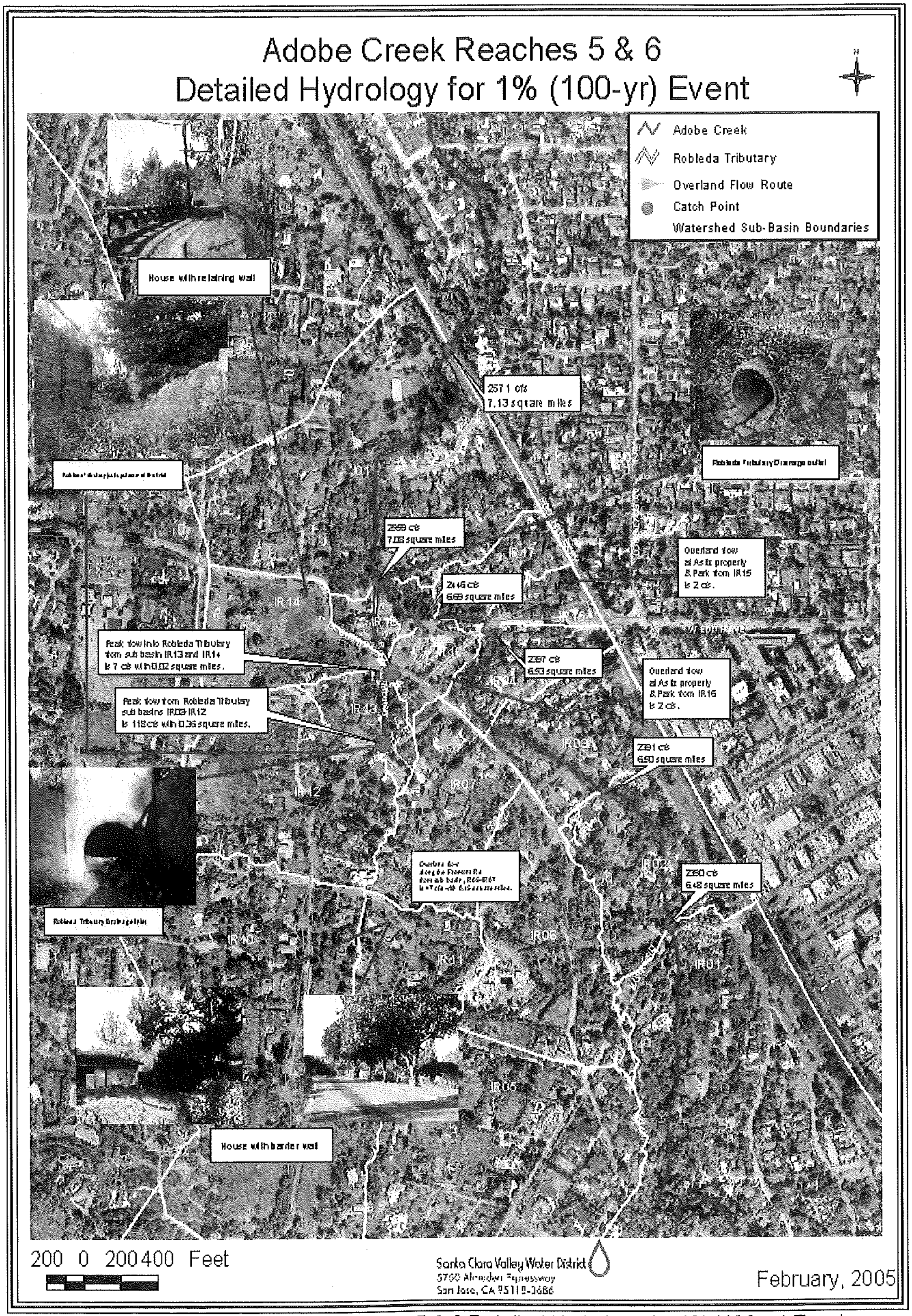
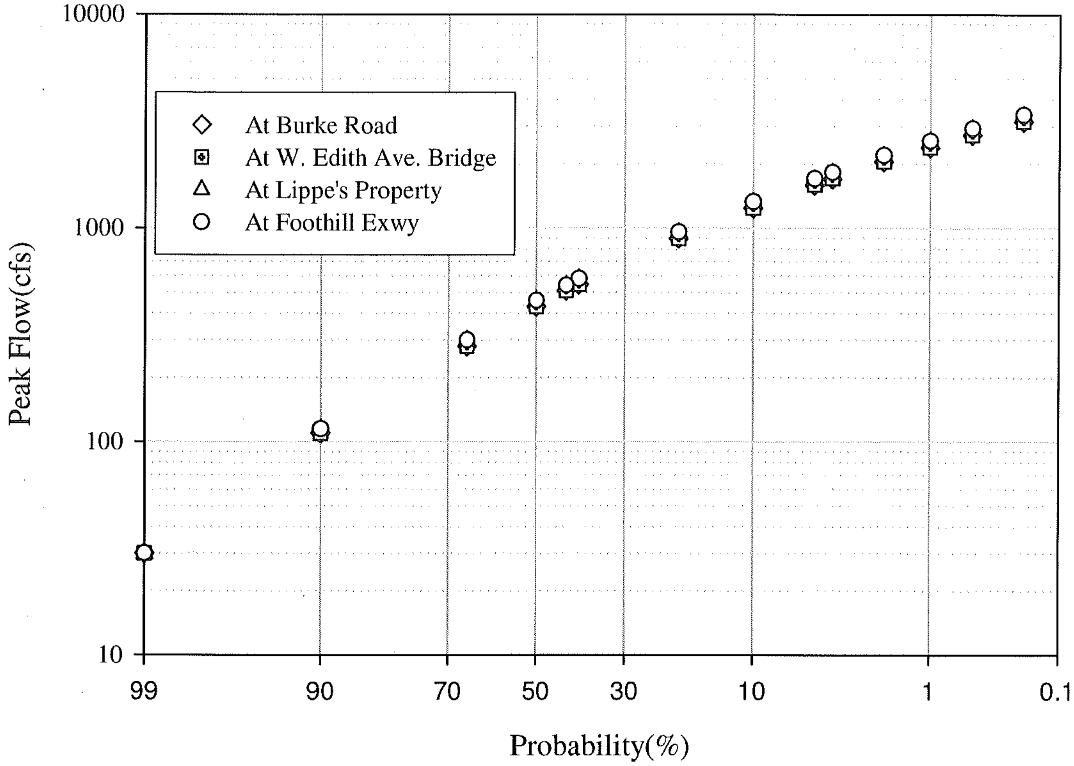


Figure 4. Adobe Creek Reaches 5 & 6 Detailed Hydrology for 1% (100-yr) Event

Adobe Creek Reaches 5 & 6



APPENDIX A

HYDROLOGY PROCEDURES

For more detailed information on the hydrology procedures, please refer to the District's *Hydrology Procedure*, July 2004.

1. DESIGN STORM PRECIPITATION

The design storm precipitation has been obtained and used to estimate the flood runoff magnitude using an appropriate rainfall-runoff model. For this study, precipitation was obtained by data transpositioned from gaged locations to ungaged site and checked by using the global regional equation for reasonableness. The two methods are described below:

1.1 Global Regional Equations From the isohyetal map of mean annual precipitation (MAP), locate the specific location of the site and determine the MAP. Some interpolation may be required to obtain the MAP. The MAP for the study area ranges from 25 inches to 19 inches as shown in Figure A1 . For this study, the averaged MAP is about 21 inches.

Given the mean annual precipitation for the ungaged site, the precipitation intensity is calculated as:

$$i_{T,D} = \frac{a_1 T^{a_2} \exp[SD_e^{\,2}/2]}{D^{a_3}}$$

where $i_{T,D}$ is the predicted precipitation intensity (in inches per hour) at return period T (in years as the recurrence intervals) and duration D (in hours); $[a_1, a_2, a_3]$ are model coefficients; and, SD_e is the standard deviation of the model residuals (random term).

The precipitation depth (in inches) $x_{T,D}$ can be simply obtained from the precipitation intensity $i_{T,D}$ by the following relation:

$$x_{T,D} = i_{T,D} . D$$

For short duration rainfall of a 1% event (specifically for durations of 5 minutes, 10 minutes, up to as much as 24 hours), the model parameters $[a_1, a_2, a_3]$ are estimated as follows:

$$a_1 = 0.2675 + 0.01199 \cdot MAP + 0.00002472 \cdot E$$
$$a_2 = 0.167033$$
$$a_3 = 0.5853 - 0.004155 \cdot MAP - 0.000001096 \cdot E$$

where MAP is the mean annual precipitation in inches and E is the elevation of the ungaged site in feet. Note that the parameter a_2 is a constant parameter. One more parameter needed in the $i_{T,D}$ equation is the standard deviation of the model residuals (model error term). The standard deviation for the short duration data is $SD_e=0.12003$ and for this study, $D = 24$ hours, E is about 285 feet.

1.2 Data Transposition from Gaged to Ungaged Site

For an ungaged site, determine if there is any precipitation gaging station nearby to the ungaged site of interest. If a gaging station exists, obtain the design storm rainfall corresponding to the desired returned period from the historical precipitation-duration-frequency curve for this gaged site. This design storm is assumed to represent the design storm for the ungaged site. If there are significant differences in elevations or topographic features between the ungaged and the gaged site, despite their proximity, their precipitation regimes can be very different. Note that the duration D for short duration rainfall analysis in the $i_{T,D}$ equation is in terms of hours.

2 STREAMFLOW REGRESSION EQUATIONS

Since the early 1970s, the District has utilized regional regression and correlation techniques to estimate design flows at rural and ungaged locations. The regional regression equations are formulas consisting of flow information such as values from gaged stations as dependent variables and measurable watershed characteristics as independent variables. The application of these equations on ungaged locations will result in estimates of flood flow from any watershed for certain selected frequencies (e.g. 1% or 10% design flows). Regional equations usually apply to rural watersheds. The District updated the regional regression model in 2003 to include data through 2000 based on the following criteria:

1. Use the historic data. No stochastic data are included.
2. Use the data from Santa Clara County and Santa Cruz County.
3. Regress the quantiles and not the statistics.

Based on these criteria, the data were reevaluated and the results of the statistical analyses have been utilized in this regression analysis. The outcomes of this study are documented in an addendum report entitled *Development of Regional Regression Equations to Calculate Flood Quantiles in Santa Clara County* (October, 2003). The 2003 regional regression to estimate 24-hr peaks and 1-day volumes for both the 1% and 10% quantiles are as shown below:

FOR PEAKS:

$$Q_{1\%} = 11.22 \times A^{0.954} \times MAP^{1.03}$$
$$Q_{10\%} = 2.985 \times A^{0.988} \times MAP^{1.173}$$

Where:
A = the watershed area in square miles
MAP = the mean annual precipitation in inches

FOR VOLUMES:

$$V_{1\%} = 2.254 \times A^{0.964} \times MAP^{1.187}$$

$$V_{10\%} = 0.895 \times A^{0.933} \times MAP^{1.244}$$

Where:

A = the watershed area in square miles
MAP = the mean annual precipitation in inches

Note: The 24-hr volume is equal to the 1-day volume multiplied by the approximate value of 1.15.

3. LOSS RATES

The loss rates for the rural and pervious parts of sub-watersheds are calculated using the Soil Conservation Service (SCS) Curve Number (CN) method. For all impervious areas, loss rates are assumed to be minimal. The hydrologic soil type, the Antecedent Moisture Condition (AMC) and the ground cover are defined for each sub-watershed and are used to determine the respective Initial Abstraction (Ia) and the CN values for an average watershed condition, AMC 2.

The Antecedent Moisture Conditions are further calibrated for various watershed conditions and various frequencies of occurrences using the flood volumes obtained from the regression model and those obtained from the rainfall-runoff model. Based on this information, the Ia and CN values for the updated AMC are calculated and input into the HEC-1 model. A map of hydrologic soil types for each watershed is included in the Figure A2. The updated AMC is 2.25 for the 1% event and 1.25 for the 10% event in this study.

For the rural and pervious parts of the watershed, the loss parameters are calculated based on the calibration process with regression results. This process of calibration has made the rainfall-generated flood quantiles more reliable as design floods of known probability of occurrence.

4. CLARK'S SYNTHETIC HYDROGRAPH PARAMETERS (Tc and R)

The unit hydrograph parameters applicable to this study are calculated. Rural, pervious and impervious parts of each sub-watershed are considered separately (refer to Figure A3). The Time of Concentration (Tc) is calculated using Kirby Hathaway's formula:

$$Tc = 0.01377[(L * n)^{0.47} S^{-0.235}]$$

Where:

L=distance of overland flow in feet (ft)
n=Manning's watershed roughness coefficient
S=average slope in ft/ft

The Routing Coefficient (R) is calculated based on an acceptable routing indicator: R/(Tc+R). This indicator directly impacts the peaking characteristics of hydrographs. For rural and pervious sub-sub-watersheds, the indicator is assumed to range between 0.5 and 0.9 based on the calibration process with regression quantiles. For impervious sub-sub watersheds, the indicator is assumed to range between 0.1 and 0.5.

5. URBAN HYDROLOGY

In 1996, an urban hydrology procedure was developed which addressed the impact of urban growth on flood flows, and this procedure is used for this study. This procedure accounts for the effects on runoff due to two major urban changes: increased imperviousness and increased channelization. Increased imperviousness reduces the overland flow travel time and thus increases the volume of flow. Increased channelization addresses the impact of conveyance through gutters and storm drains together with the increased storage capability of these facilities. The effects of channelization are most pronounced in flat terrain with slopes less than 0.003. Imperviousness represents coverage from streets, buildings and other lot coverage. The coverage from streets in urban residential areas ranges from 2% to 25%, while for other land uses the value can be as high as 95% of the total lot area. The concept of "Equivalent Street" is obtained from the land use requirements for ratio of streets as a part of the total urban sub-watershed. Based on this equivalent street concept, the length and width of streets in an urbanized area are defined and, hence, the unit hydrograph parameters are calculated. The following are the formulas used in this study to calculate unit hydrograph parameters as input to HEC-1.

Equivalent street length (all measurements are in ft) is calculated by the equation:

$$L_{st}=A_{st}/W_{st}$$

Where:

L_{st} = the equivalent street length
A_{st} = area of streets, (from land use guidelines)
W_{st} = width of streets (from traffic guidelines)

Overland flow length is calculated by the equations:

$$L_i = (A_i - A_{st})/2L_{st}$$
$$L_p = A_p/2L_{st}$$

Where:

L_i = length of overland flow of impervious area
A_i = impervious area, (from land use guidelines)
L_p = length of overland flow of pervious area
A_p = pervious area

The impervious length of overland flow is given by the equation $L_{imp} = L_i + L_{Cb}$ where L_{Cb} is the length of flow to the first catch basin, and L_i is defined above. The pervious length is given by the equation $L_{perv} = L_p + L_{imp}$.

The Time of Concentration (Tc) is calculated separately for pervious and impervious areas using Kirby-Hathaway's formula as defined in Section A.4. The Time of Concentration for impervious areas is calculated as:

$$Tc_{imp} = Tc_i + Tc_{cb}$$

Where:

Tc_{imp} = Time of Concentration for the impervious area
Tc_i = Time of Concentration of overland flow over impervious area
Tc_{cb} = Time of Concentration of flow length to first catch basin

Time of concentration for pervious areas is calculated as:

$$Tc_{perv} = Tc_p + Tc_{imp}$$

Where:

Tc_{perv} = Time of Concentration for pervious area
Tc_p = Time of Concentration of overland flow over pervious area
Tc_{imp} = Time of Concentration of the impervious length of overland flow

The corresponding times of concentration for sub watersheds are listed in Table B1 and B2 in Appendix B.

6. ROUTING PROCEDURES

Most of the flood waters from urban areas are conveyed to flood control channels via storm drain systems. Figure A4 shows the general unitized (prorated to one square mile of an area) storage-discharge rating curves that may be applied to valley urban areas. The combined pervious and impervious inflow hydrographs for a study area are routed through the storm drains using the modified pulse routing method. The storage-discharge relationship for that area is calculated from a unitized relationship and applied to obtain the outflow from the storm drain system. The storage routing usually consists of two types of boundary conditions: namely, "with barrier" (eg. berms, levees, houses and etc.) and "without barrier" conditions. The "with barrier" conditions can be found in the lower parts of a watershed, where the lay of the land has flat or mild slopes (generally less than 0.02). Here, the urban runoff can only reach the creeks through the storm drain system, without the possibility of overland connections. The "without barrier" condition generally exists at the upper part of a watershed where slopes are steep (generally greater than 0.02), or in areas without flood control improvements. Runoff water from these areas without barriers normally finds its overland course and eventually reaches the creek channels.

Muskingum-Cunge channel routing procedures were applied to most watersheds except sub-watershed IR-03, IR-04, IR-17 and IR-18 where the hydrographs were combined directly.

7. DESIGN HYDROGRAPH ESTIMATION FOR RURAL AND URBAN WATERSHEDS

The hydrologic modeling tool used for this study is the HEC-1 Flood Hydrograph Package developed by the U.S. Army Corps of Engineers (1998).

The HEC-1 model has several optional procedures to simulate the various components of the rainfall-runoff process in a watershed. Based on previous modeling studies of rural and urban watersheds around the Santa Clara Valley, the approach adopted by the District in the use of the HEC-1 model for rainfall-runoff modeling is summarized as follows:

- The SCS curve number is calculated based on Hydrologic Soil Groups in Santa Clara County published by the United States Department of Agriculture, Soil Conservation Service.
- The longest rural channel is defined as a sum of the main channel length and overland flow length. The slope for the basin is calculated using the elevation difference divided by the longest rural length.
- Watershed boundaries are delineated using information described in Section 4.1. For rural areas, the boundary is assumed to follow the contour lines. For urban areas, the boundary is assumed to follow the streets, the storm drain system and the natural land contours.
- The SCVWD Maps of Flood Control Facilities and Limits of 1% Flooding are utilized for channel routing information.

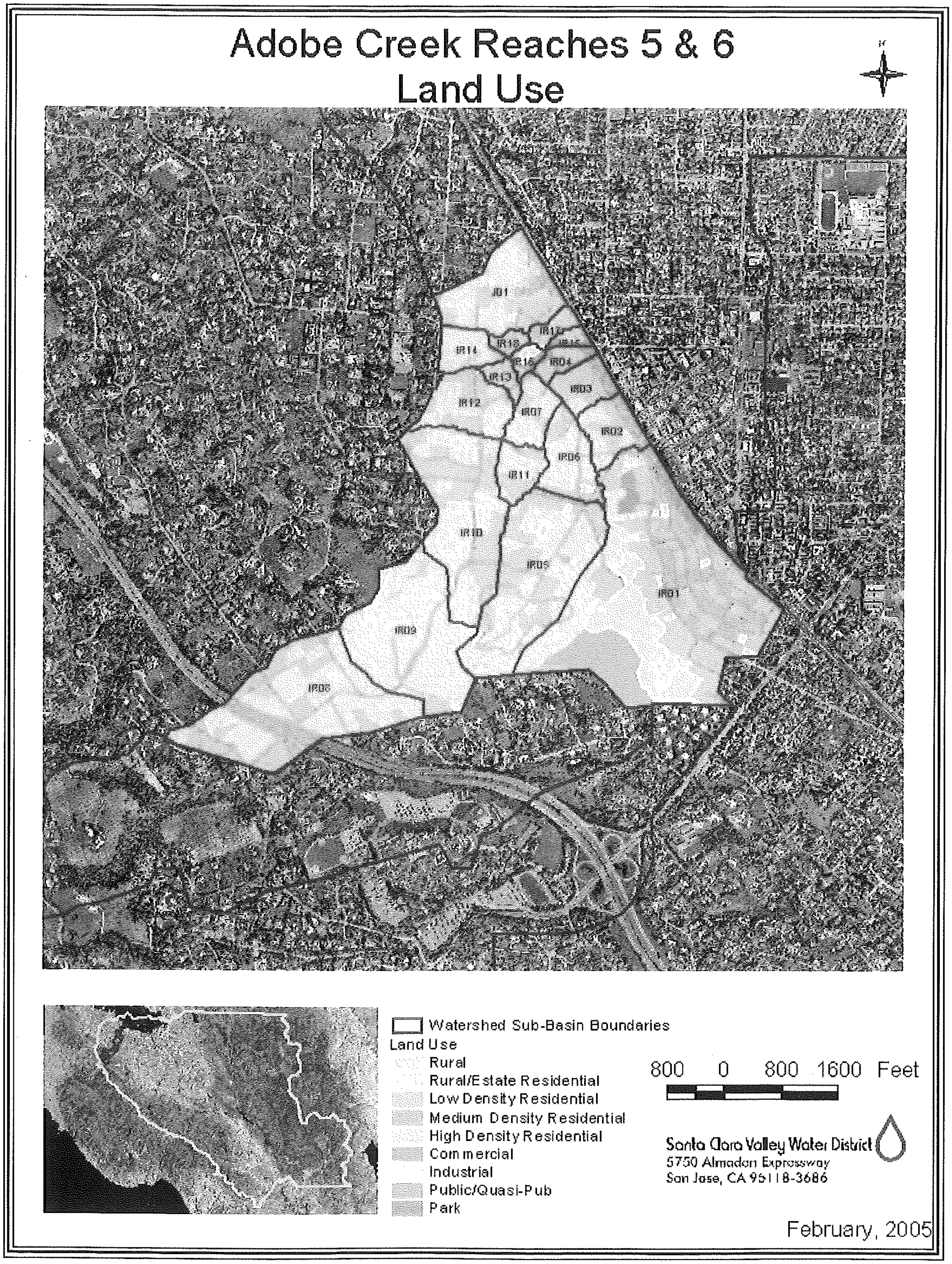


Figure A1. Adobe Creek Reaches 5 & 6 Land Use

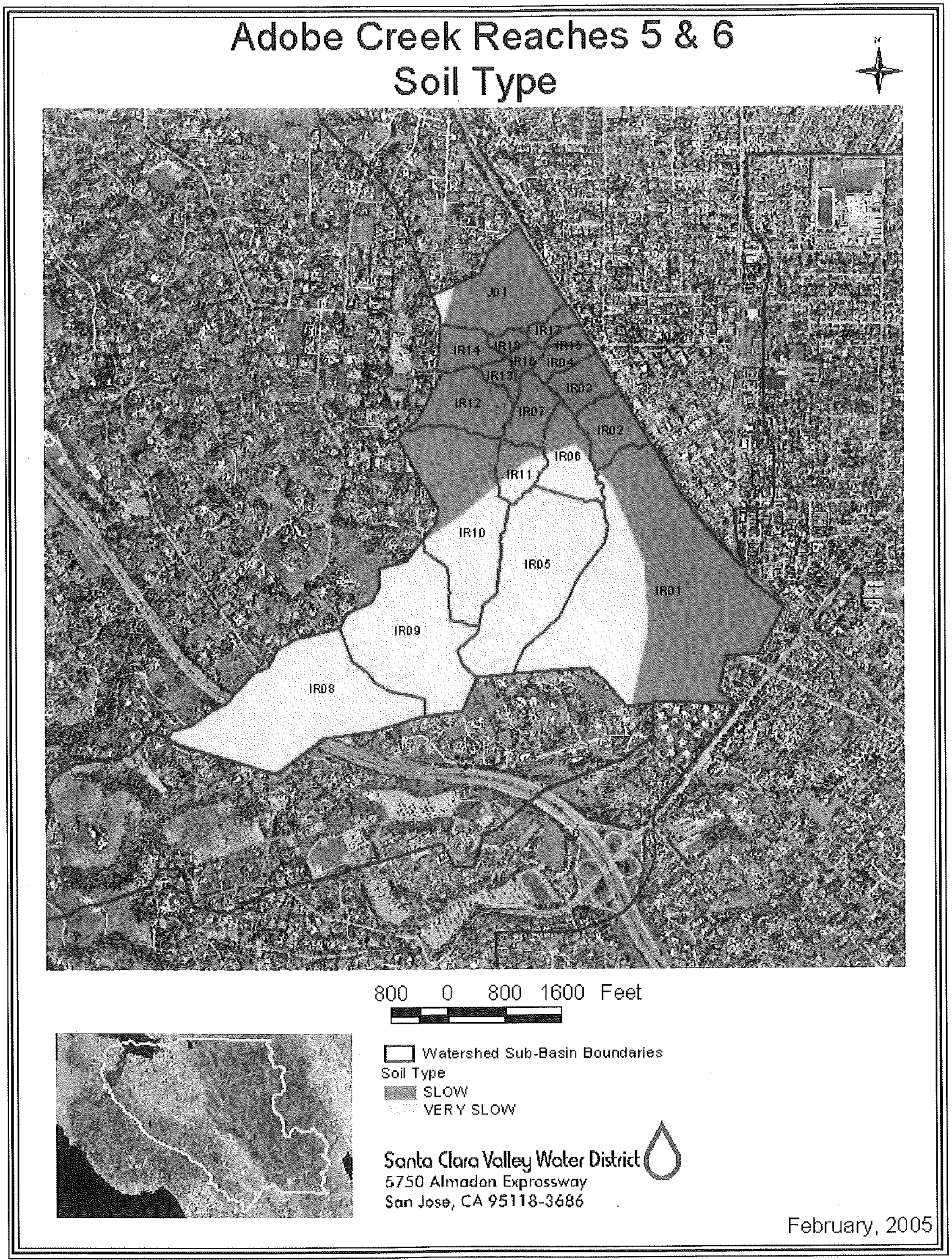


Figure A2. Adobe Creek Reaches 5 & 6 Soil Type

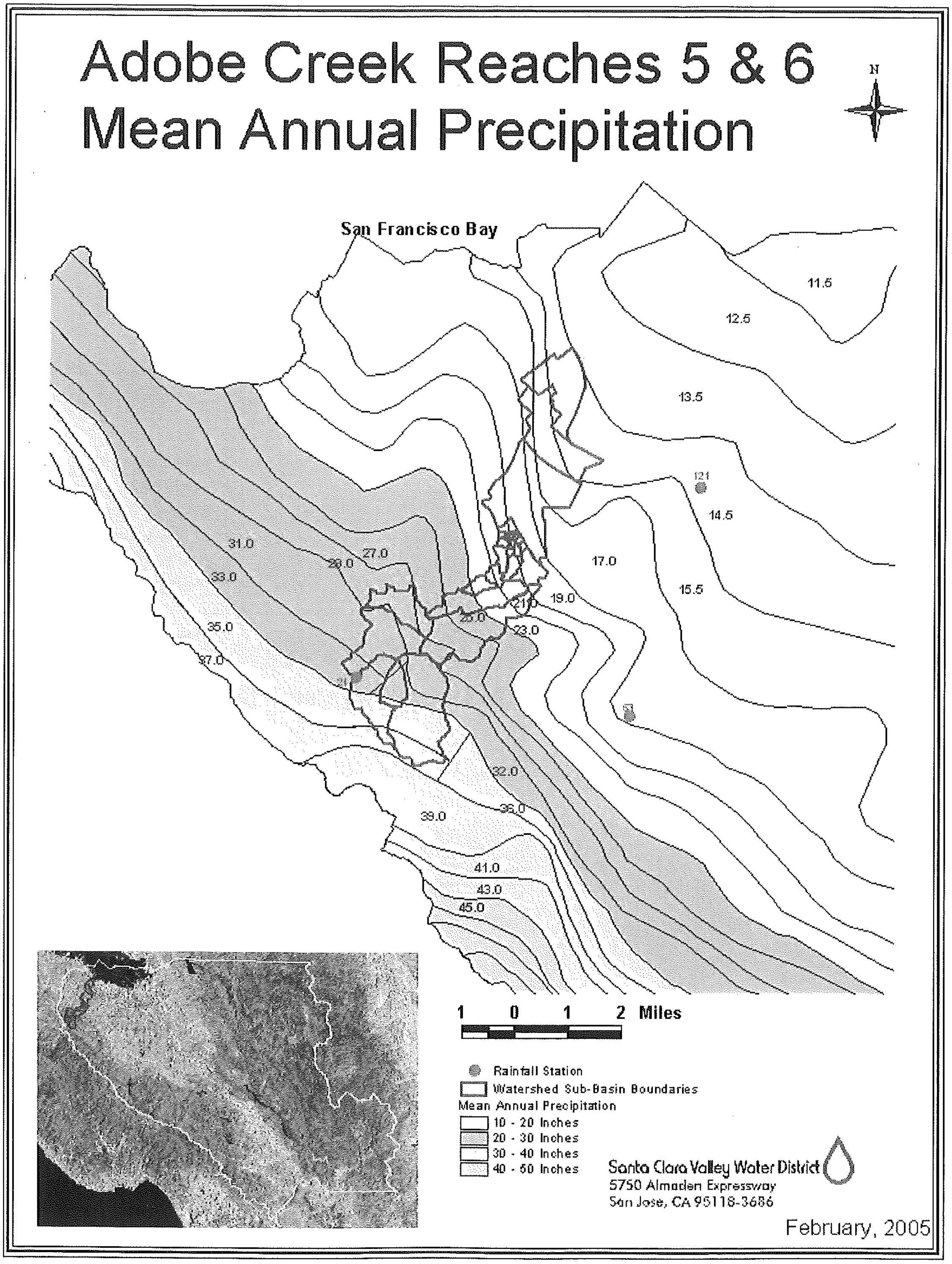


Figure A3. Adobe Creek Reaches 5 & 6 Mean Annual Precipitation

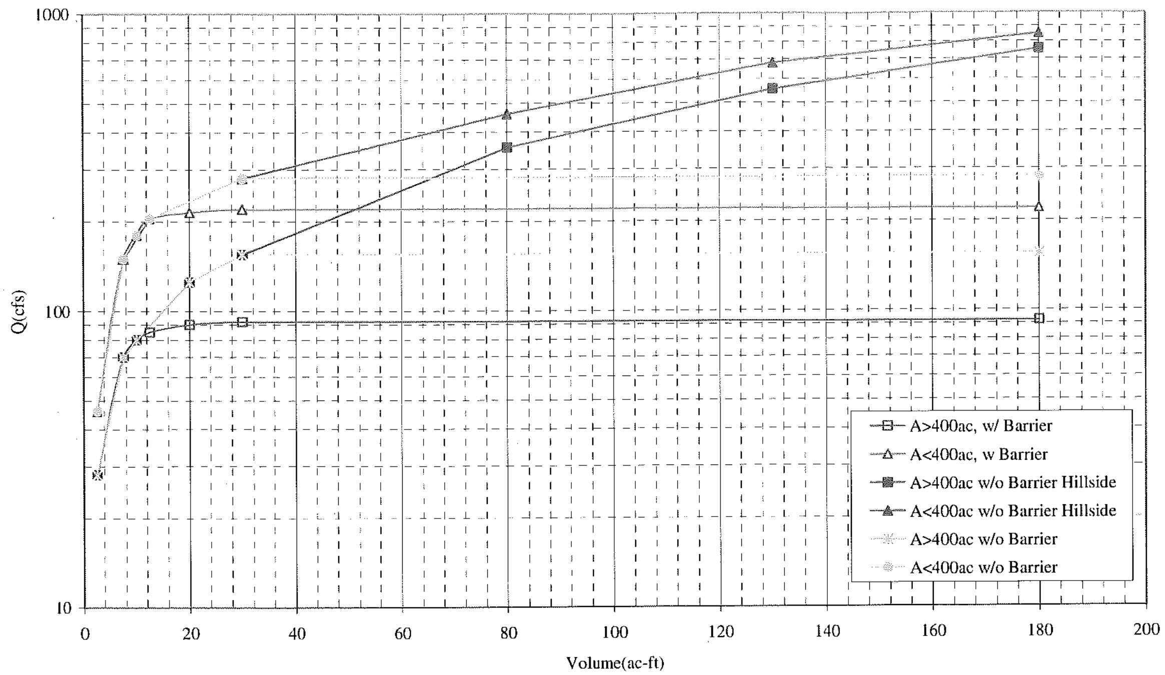


Figure A4. General Unitized Storage-Discharge Rating Curve (prorated to one square mile of an area)

APPENDIX B

Table B1 Adobe (1% HEC-1 Input Data)

	Total Area	Rural Area	Perv Area	Imp. Area	Rural Ia - Calc	Rural CN	Perv Ia - Calc	Perv CN	Imp. Ia - Calc	Imp. CN	Rural Tc	Rural R	Tc_{Perv}	R_{Perv}	Tc_{Imp}	$R_{Imp.}$
BASIN	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	0.305	0.305			0.48	81					0.29	0.87				
B	0.769	0.769			0.48	81					0.49	1.48				
C	1.699	1.699			0.59	77					0.56	1.30				
D	0.558	0.238	0.240	0.080	0.68	75	0.42	83	0.04	98	0.50	1.17	0.45	1.06	0.21	0.14
E	0.968	0.795	0.121	0.052	0.48	81	0.32	86	0.04	98	0.50	1.17	0.42	0.99	0.21	0.14
F	0.602	0.074	0.290	0.237	0.65	75	0.40	84	0.04	98	0.30	0.71	0.41	0.96	0.22	0.15
G	1.323	0.349	0.536	0.438	0.59	77	0.42	83	0.04	98	0.31	0.93	0.39	1.18	0.22	0.15
IR01	0.253	0.046	0.093	0.114	0.59	77	0.37	84	0.04	98	0.46	1.38	0.41	1.23	0.23	0.15
IR02	0.022		0.012	0.010			0.42	83	0.04	98			0.51	1.52	0.24	0.16
IR03	0.017		0.009	0.009			0.42	83	0.04	98			0.44	1.31	0.23	0.15
IR04	0.009		0.005	0.005			0.42	83	0.04	98			0.44	1.33	0.23	0.15
IR05	0.102		0.071	0.031			0.30	87	0.04	98			0.41	1.24	0.20	0.14
IR06	0.028		0.020	0.008			0.34	85	0.04	98			0.38	1.14	0.20	0.13
IR07	0.018		0.014	0.005			0.42	83	0.04	98			0.59	1.76	0.23	0.15
IR15	0.004		0.002	0.003			0.42	83	0.04	98			0.40	1.19	0.23	0.15
IR16	0.005	0.002	0.001	0.002	0.68	75	0.42	83	0.04	98	0.22	0.67	0.59	1.78	0.28	0.19
IR17	0.007		0.003	0.004			0.42	83	0.04	98			0.40	1.21	0.24	0.16
IR08	0.123		0.074	0.049			0.30	87	0.04	98			0.37	1.12	0.21	0.14
IR09	0.097		0.073	0.024			0.30	87	0.04	98			0.38	1.14	0.20	0.13
IR10	0.092		0.060	0.032			0.34	85	0.04	98			0.45	1.35	0.22	0.14
IR11	0.016		0.012	0.004			0.34	85	0.04	98			0.40	1.20	0.20	0.13
IR12	0.032		0.022	0.010			0.42	83	0.04	98			0.45	1.34	0.21	0.14
IR13	0.007		0.005	0.002			0.42	83	0.04	98			0.38	1.13	0.20	0.13
IR14	0.015		0.011	0.004			0.42	83	0.04	98			0.45	1.36	0.21	0.14
IR18	0.005		0.002	0.003			0.42	83	0.04	98			0.59	1.76	0.37	0.24
J01	0.056		0.034	0.022			0.42	83	0.04	98			0.48	0.72	0.29	0.20
J02	1.866		0.840	1.026			0.37	84	0.04	98			0.51	0.76	0.33	0.22
K	1.109		0.333	0.776			0.34	85	0.04	98			0.38	0.57	0.23	0.16
L	0.947		0.331	0.616			0.30	87	0.04	98			0.51	0.77	0.26	0.18

1. Total area of the sub-watershed in square miles
2. The rural part of the sub-watershed, area in square miles
3. The pervious part of the sub-watershed, area in square mile
4. The impervious part of the sub-watershed, area in square miles
5. Initial Abstraction (Ia) for rural area
6. Curve Number(CN) for rural area
7. Initial Abstraction (Ia) for pervious area
8. Curve Number(CN) for pervious area
9. Initial Abstraction (Ia) for impervious area
10. Curve Number(CN) for impervious area
11. Times of Concentration(Tc) for rural area
12. Clark's Storage Routing Coefficient R for rural area
13. Times of Concentration(Tc) for pervious area
14. Clark's Storage Routing Coefficient R for pervious area
15. Times of Concentration(Tc) for impervious area
16. Clark's Storage Routing Coefficient R for impervious area

Table B2 Adobe (10% HEC-1 Input Data)

	Total Area	Rural Area	Perv Area	Imp. Area	Rural Ia - Calc	Rural CN	Perv Ia - Calc	Perv CN	Imp. Ia - Calc	Imp. CN	Rural Tc	Rural R	Tc_{Perv}	R_{Perv}	Tc_{Imp}	$R_{Imp.}$
BASIN	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	0.305	0.305			1.14	64					0.29	0.87				
B	0.769	0.769			1.14	64					0.49	1.48				
C	1.699	1.699			1.38	59					0.56	1.30				
D	0.558	0.238	0.240	0.080	1.60	56	1.03	66	0.04	98	0.50	1.17	0.45	1.06	0.21	0.14
E	0.968	0.795	0.121	0.052	1.14	64	0.82	71	0.04	98	0.50	1.17	0.42	0.99	0.21	0.14
F	0.602	0.074	0.290	0.237	1.53	57	0.99	67	0.04	98	0.30	0.71	0.41	0.96	0.22	0.15
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IR07	0.018		0.014	0.005			1.03	66	0.04	98			0.59	1.76	0.23	0.15
IR15	0.004		0.002	0.003			1.03	66	0.04	98			0.40	1.19	0.23	0.15
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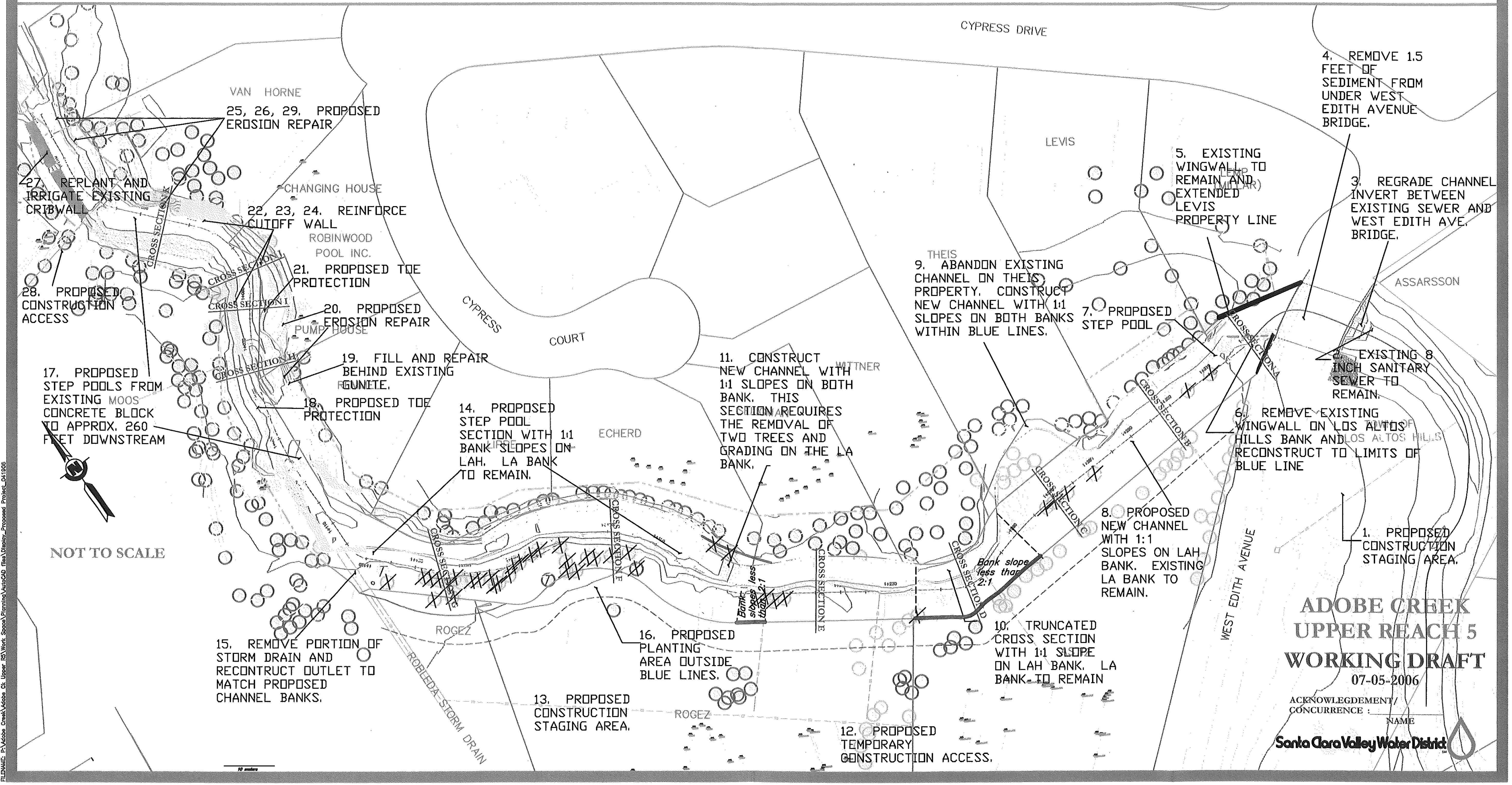
16. Clark's Storage Routing Coefficient R for impervious area

ATTACHMENT B

Collaborative Proposed Project Elements

ADOBE CREEK UPPER REACH 5 - ALTERNATIVE 8



1. PROPOSED CONSTRUCTION STAGING AREA.

2. EXISTING 8 INCH SANITARY SEWER TO REMAIN.

3. REGRADE CHANNEL INVERT BETWEEN EXISTING SEWER AND WEST EDITH AVE. BRIDGE.

4. REMOVE 1.5 FEET OF SEDIMENT FROM UNDER WEST EDITH AVENUE BRIDGE.

5. EXISTING WINGWALL TO REMAIN AND EXTENDED LEVIS PROPERTY LINE

6. REMOVE EXISTING WINGWALL ON LOS ALTOS HILLS BANK AND RECONSTRUCT TO LIMITS OF BLUE LINE

7. PROPOSED STEP POOL

8. PROPOSED NEW CHANNEL WITH 1:1 SLOPES ON LAH BANK. EXISTING LA BANK TO REMAIN.

9. ABANDON EXISTING CHANNEL ON THEIS PROPERTY. CONSTRUCT NEW CHANNEL WITH 1:1 SLOPES ON BOTH BANKS WITHIN BLUE LINES.

10. TRUNCATED CROSS SECTION WITH 1:1 SLOPE ON LAH BANK. LA BANK TO REMAIN

11. CONSTRUCT NEW CHANNEL WITH 1:1 SLOPES ON BOTH BANK. THIS SECTION REQUIRES THE REMOVAL OF TWO TREES AND GRADING ON THE LA BANK.

12. PROPOSED TEMPORARY CONSTRUCTION ACCESS.

13. PROPOSED CONSTRUCTION STAGING AREA.

14. PROPOSED STEP POOL SECTION WITH 1:1 BANK SLOPES ON LAH. LA BANK TO REMAIN.

15. REMOVE PORTION OF STORM DRAIN AND RECONTRUCT OUTLET TO MATCH PROPOSED CHANNEL BANKS.

16. PROPOSED PLANTING AREA OUTSIDE BLUE LINES.

17. PROPOSED STEP POOLS FROM EXISTING CONCRETE BLOCK TO APPROX. 260 FEET DOWNSTREAM

18. PROPOSED TOE PROTECTION

19. FILL AND REPAIR BEHIND EXISTING GUNITE.

20. PROPOSED EROSION REPAIR

21. PROPOSED TOE PROTECTION

22, 23, 24. REINFORCE CUTOFF WALL

25, 26, 29. PROPOSED EROSION REPAIR

27. REPLANT AND IRRIGATE EXISTING CRIBWALL

28. PROPOSED CONSTRUCTION ACCESS

NOT TO SCALE

ADOBE CREEK
UPPER REACH 5
WORKING DRAFT
07-05-2006

ACKNOWLEGDEMENT/
CONCURRENCE : ____________
NAME

Santa Clara Valley Water District

USERNAME: tonyndah Wed 05 Jul 2006 04:51pm
FILENAME: P:\Adobe Creek\Adobe Ck Upper R5\Work Space\Planning\AutoCAD files\Display_Proposed Project_041806

Adobe Creek Upper Reach 5
Proposed Project Elements Table

June 14, 2006

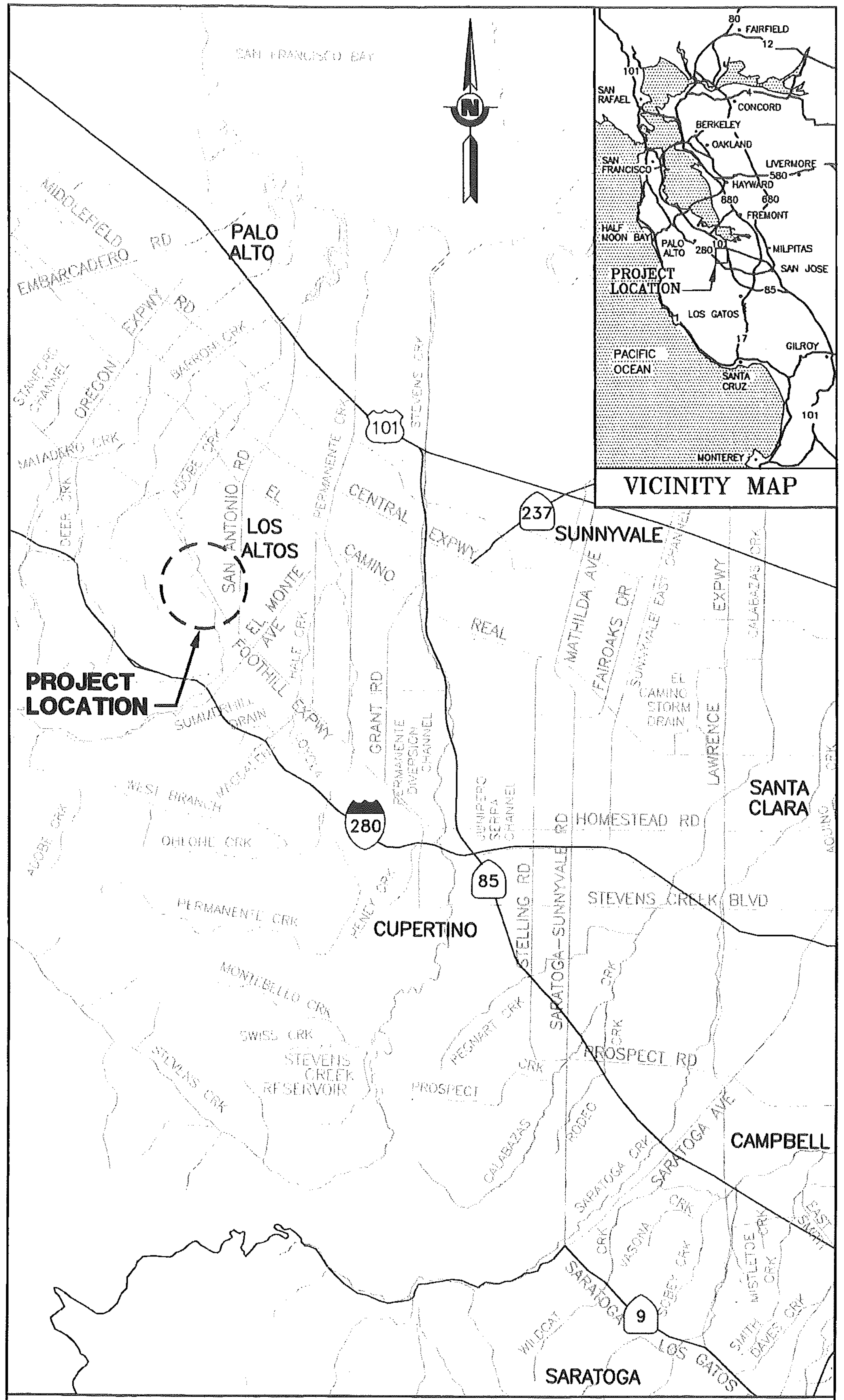
No.	Project Element	Status	Resolution
1	Construction staging area at Edith Park		
2	Existing sanitary sewer line upstream of West Edith Avenue Bridge.		Sewer line to remain
3	Channel invert between existing sewer line and upstream face of West Edith Avenue Bridge.		Regrade channel invert
4	Sediment removal under West Edith Avenue Bridge		Remove 1.5 feet of sediment underneath West Edith Avenue Bridge.
5	Existing wing wall on Los Altos creek		Existing wing wall to remain. Extend wing wall to Millar/Levis property line.
6	Existing wing wall on Los Altos Hills creekside.		Remove existing wing wall and construct new retaining wall from downstream face of West Edith Avenue bridge to limits of blue line on Los Altos Hills creek bank.
7	Construct one step pool downstream of West Edith Avenue Bridge.		
8	Construct new channel with 2:1 slopes or flatter on LAH side. Cross section will intersect existing ground on LA side.		Existing hardscape on Los Altos creekside to remain. Cutoff walls for the existing gunite will be reinforced. Existing wood bank protection at Millar and Wittner property to be removed. Chain link fence at Lippe property to be removed.
9	Abandon existing channel on Thies property.		Construct new channel with 2:1 bank slopes or flatter and abandon existing channel on Thies property. Need TCE from Thies prior to performing work.
10	Construct new channel with 1:1 slopes or flatter on LAH side with bank protection due to truncated cross section.		Cross section at this location is constricted i.e. 2 BF width is NOT achieved. This section needs bank slope protection for the LAH side. Staff to discuss impacts of bank slope protection on trees of value with property owner and resource agencies.
11	Construct new channel with 1:1 slopes or flatter on LAH side.		Construction of this cross section will involve the grading on the LA bank (Seligman/Echerd) and the removal of two trees.
12	Temporary creek access from Fremont Road		
13	Construction staging area on Los Altos Hills creekside.		

No.	Project Element	Status	Resolution
14	Construct new channel with step pools.		Existing bank on LA side to remain. 2:1 bank slope or flatter on the LAH side. Reinforce cutoff wall for existing gunite. Cross section exceeds blue line near storm drain outlet. Issue has been resolved with property owner.
15	Remove portion of storm drain and reconstruct outlet.		Portion of storm drain to be removed to match proposed channel banks.
16	Planting limits outside of blue line on Los Altos Hills side		
17	Modify invert from existing concrete drop structure to approximately 260 feet downstream. Existing concrete block to remain.		Provide equivalent level of protection at existing rock slope protection along Moos property.
18	Protect bank toe on Moos property between existing rock slope protection and existing sackcrete protection.		Provide toe protection up to 3 feet above channel invert (2 BF height).
19	Fill cavity behind existing gunite at Remmel property with concrete material or similar.		
20	Repair bank erosion at Remmel property with rock slope protection from end of existing gunite to include protection along channel bank at existing Robinwood Pool pump house.		Height of rock slope protection to the 10-year water surface elevation.
21	Bank slope protection at Robinwood Pool property		Protect creek invert and provide toe protection 3 feet above creek invert (2 BF height)
22	Reinforce cutoff wall at existing sackcrete slope protection on Moos property.		Use concrete material or similar
23	Reinforce cutoff wall at existing sackcrete slope protection on Robinwood pool property.		Use concrete material or similar
24	Reinforce cutoff wall at existing sackcrete slope protection on Van Horne property.		Use concrete material or similar
25	Repair bank erosion at Van Horne property downstream of existing sackcrete slope protection.		Height of rock slope protection to the 10-year water surface elevation.
26	Repair bank erosion at Van Horne property at existing storm drain on property.		Height of rock slope protection to the 10-year water surface elevation.
27	Crib wall at Ward property		Crib wall to be replanted, and irrigated.
28	Temporary access for creek downstream of Robleda storm drain outlet		
29	Repair erosion at Neirmann property along base of exposed redwood tree roots.		
30	Assarson property creek bank		Existing creek banks to remain.

ATTACHMENT C

Preliminary Map and General Plans

USERNAME: michsuto Wed 13 Jun 2007 01:20pm
FILENAME: K:\Active Projects\MP-10104011\R5 Design\ER\G-01



LOCATION MAP
SCALE: 1:5000

MAP AND GENERAL PLAN
FOR
ADOBE CREEK UPPER REACH 5
RESTORATION PROJECT

FROM 300 METERS UPSTREAM OF FOOTHILL
EXPRESSWAY TO WEST EDITH AVENUE

Santa Clara Valley Water District℠

APPROVED BY:

Saied Hossini 6/13/07
SAEID S. HOSSEINI DATE
SENIOR PROJECT MANAGER-CPSD
SANTA CLARA VALLEY WATER DISTRICT

SAEID S. HOSSEINI
No. 50920
9/30/07
CIVIL

Katherine Oven 6/13/07
KATHERINE OVEN DATE
ASSISTANT OPERATING OFFICER-CPSD
SANTA CLARA VALLEY WATER DISTRICT

ENGINEER'S REPORT
06-14-07

PROJECT NUMBER	10104011
SHEET CODE:	G-1
PAGE NUMBER:	1 OF 12

DOCUMENT_NUMBER

USERNAME: micnsulo Wed 13 Jun 2007 01 20pm
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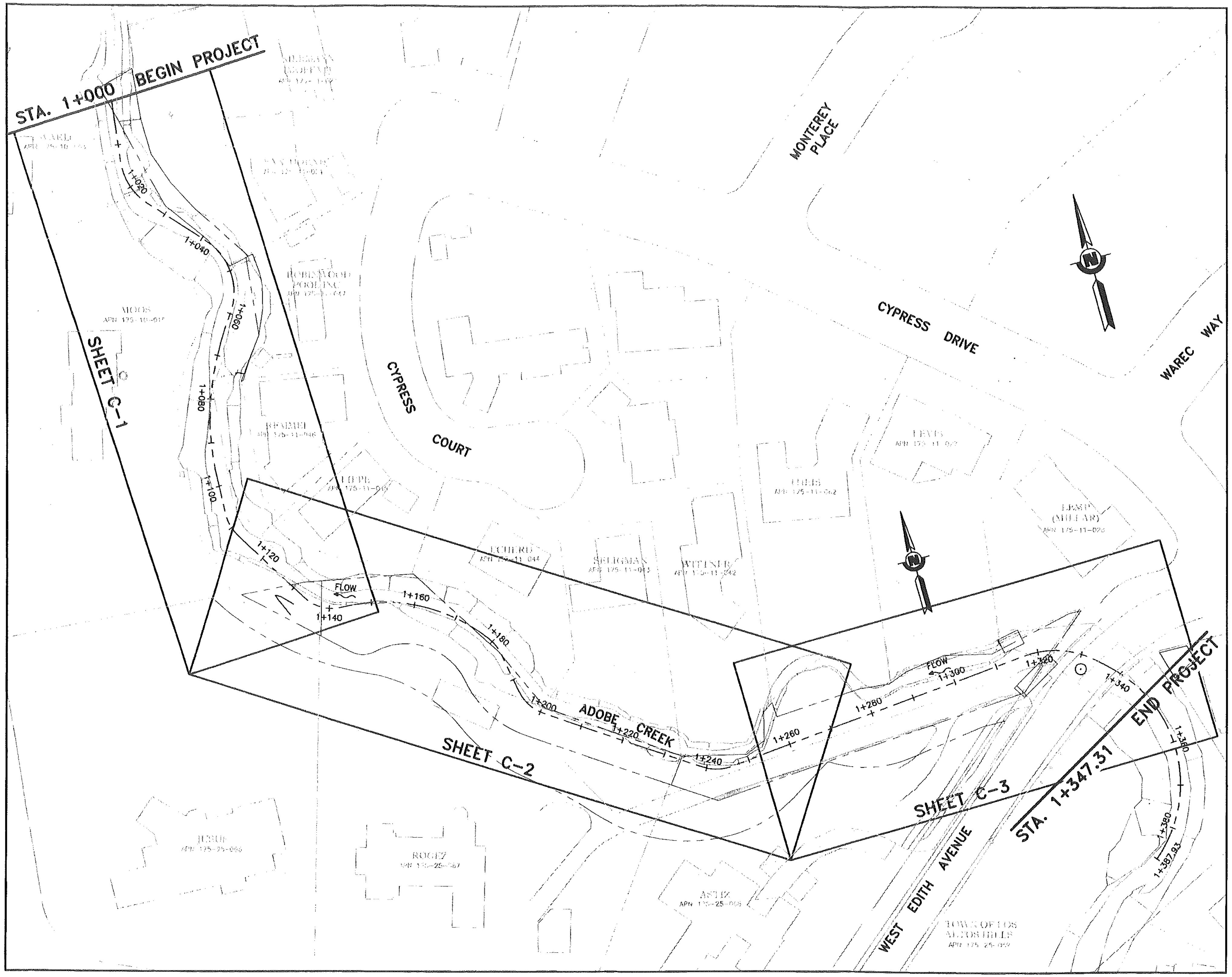


INDEX MAP

SCALE: 1:500

SHEET CODE	SHEET DESCRIPTION	PAGE NO.
	GENERAL	
G-1	LOCATION MAP AND TITLE SHEET	1 OF 12
G-2	INDEX MAP, DRAWING LIST & GENERAL NOTES	2 OF 12
G-3	ABBREVIATIONS, LEGEND & SYMBOLS	3 OF 12
G-4	SURVEY LAYOUT	4 OF 12
G-5	STAGING AREA AND SITE ACCESS	5 OF 12
	DEMOLITION	
D-1	DEMOLITION PLAN – TREE REMOVAL	6 OF 12
D-2	DEMOLITION PLAN – MISCELLANEOUS MATERIAL REMOVAL	7 OF 12
	CIVIL	
C-1	PLAN AND PROFILE, STA 1+000 TO STA 1+130	8 OF 12
C-2	PLAN AND PROFILE, STA 1+130 TO STA 1+260	9 OF 12
C-3	PLAN AND PROFILE, STA 1+260 TO STA 1+347.31	10 OF 12
C-4	TYPICAL CHANNEL SECTIONS	11 OF 12
C-5	TYPICAL CHANNEL SECTIONS	12 OF 12

GENERAL NOTES

1. ALL EXISTING FACILITIES, STRUCTURES, TREES, FENCES, LANDSCAPING, ETC., DESIGNATED "EXIST" OR SHOWN EXISTING (DASHED LINES) ARE TO REMAIN. ONLY THOSE SPECIFICALLY DESIGNATED FOR REMOVAL AS SHOWN ON THE DRAWINGS, OR AS DIRECTED BY THE ENGINEER, SHALL BE REMOVED.
2. ALL REFERENCES MADE TO RIGHT OR LEFT AND ALL CROSS-SECTIONS SHOWN ON THE PLANS ARE VIEWED LOOKING UPSTREAM.
3. ELECTRICAL AND TELEPHONE LINES SHOWN ON THE PLANS ARE OVERHEAD FACILITIES, UNLESS NOTED OTHERWISE.
4. LOCATIONS AND DEPTHS OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THE PLANS ARE BASED ON INFORMATION FROM THE UTILITY COMPANY AND ARE TO BE CONSIDERED AS APPROXIMATE ONLY.
5. PRIOR TO PERFORMING ANY WORK IN THE VICINITY OF EXISTING UNDERGROUND UTILITIES, THE CONTRACTOR SHALL VERIFY THEIR LOCATIONS AND DEPTHS AND TAKE PROPER PRECAUTIONS TO AVOID ANY DAMAGE TO THEM. CALL UNDERGROUND SERVICE ALERT AT (800) 642-2444 FOR LOCATION.
6. THE CONTRACTOR SHALL COMPLY WITH THE REQUIREMENTS OF THE STATE WATER RESOURCES CONTROL BOARD FOR STORM WATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITIES.
7. UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE IN METERS.

DESIGN NOTES

1. DESIGN DISCHARGE IS: Q = 31.15 CMS
2. MANNINGS ROUGHNESS COEFFICIENT (N) IS AS FOLLOWS WHERE APPLICABLE.
   A. EARTH CHANNEL = 0.050
   B. ROCK CHANNEL = 0.040
   C. REVEGETATION AREAS = 0.070
3. UNIT STRENGTHS FOR REINFORCED CONCRETE ARE AS FOLLOWS:
   A. CONCRETE F'C MPA = 30 OR AS OTHERWISE SPECIFIED
   B. STEEL FY MPA = 420 OR AS OTHERWISE SPECIFIED
4. BASIS OF ELEVATION: NORTH AMERICAN VERTICAL DATUM 1988 (NAVD88) USING S.C.V.W.D. VERTICAL CONTROL. VERTICAL CONTROL BASED ON SCVWD BENCHMARKS BM288 AND BM520.
5. BASIS OF BEARING: NORTH AMERICAN DATUM 1983 (NAD83) CALIFORNIA COORDINATE SYSTEM ZONE III (METERS).
6. SEE SHEET G-4 FOR CONTROL LINE LAYOUT & SURVEY CONTROL.

DOCUMENT_NUMBER

REV	DESCRIPTION	DATE	APPR.

REFERENCE INFORMATION AND NOTES

ENGINEER'S REPORT
06-14-07

DATE
06/06/07
DESIGN
C. CHUNG
DRAWN
L.P./M.S.
CHECKED
T. NDAH

ENGINEERING CERTIFICATION
TONY TEGHEN NDAH
No. 067634
Exp. 06/30/07
CIVIL
6/14/07
PROJECT ENGINEER MM-DD-YY

Santa Clara Valley Water District

PROJECT NAME AND SHEET DESCRIPTION:

ADOBE CREEK UPPER REACH 5 RESTORATION PROJECT

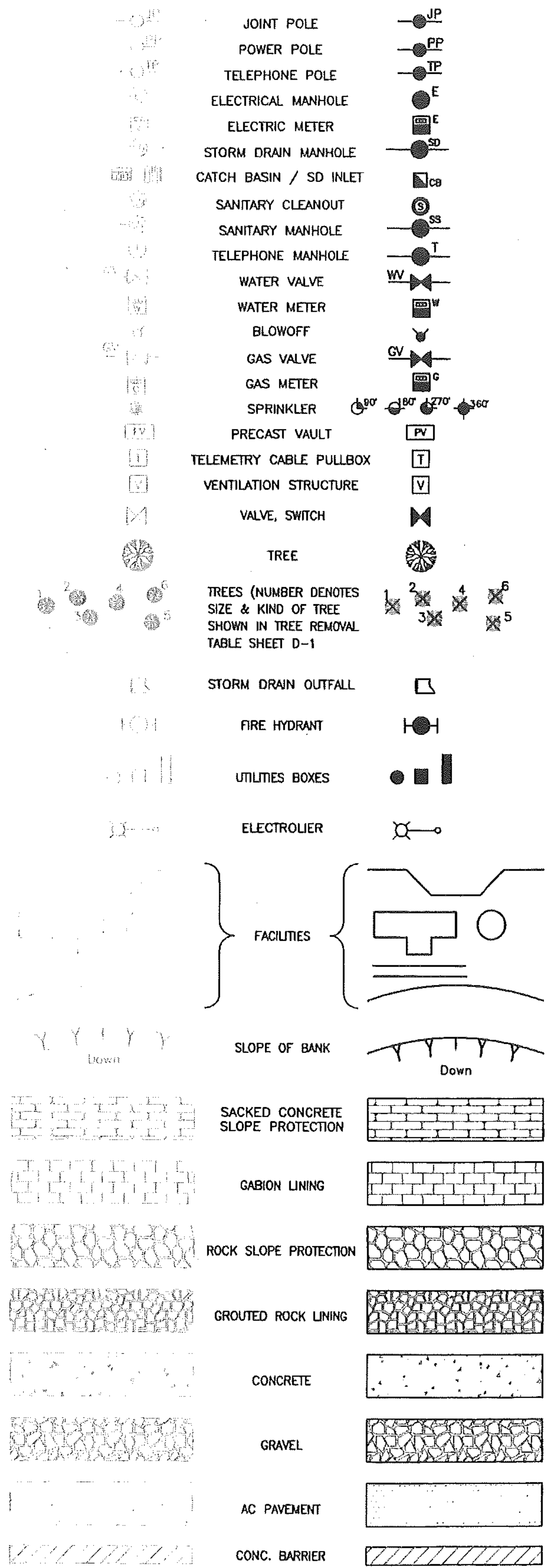
INDEX MAP, DRAWING LIST & GENERAL NOTES

SCALE
AS SHOWN
VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

PROJECT NUMBER
10104011
SHEET CODE:
G-2
PAGE NUMBER:
2 OF 12

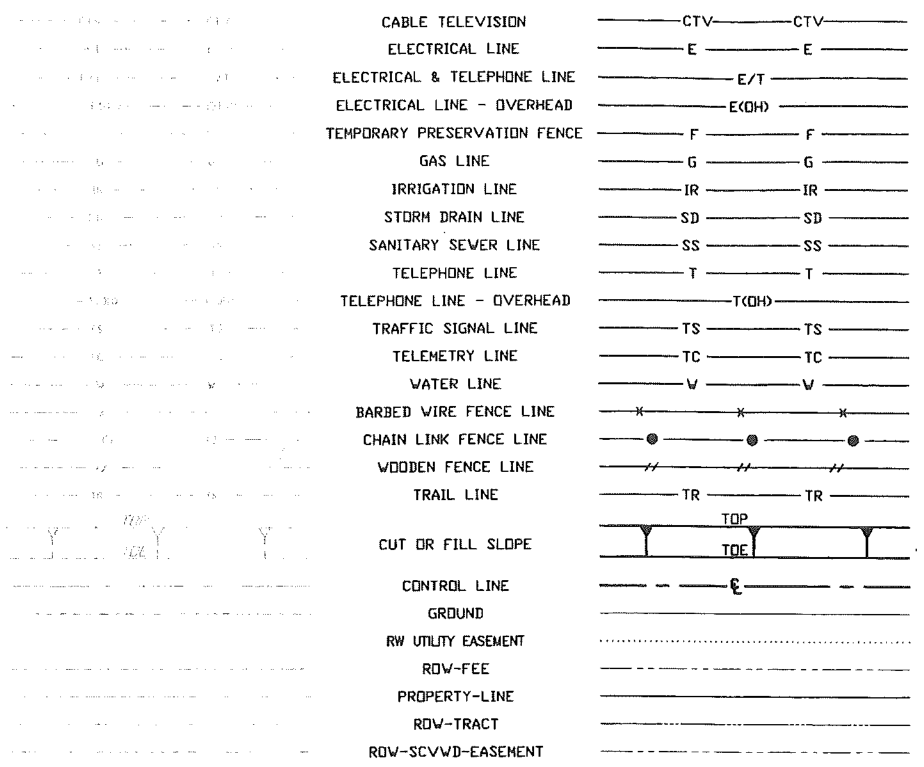
USERNAME: michsuto Wed 13 Jun 2007 01 20pm
FILENAME: K:\Active Projects\MP-10104011\R5 Design\ER\G-03

EXISTING / PROPOSED



- JOINT POLE (JP)
- POWER POLE (PP)
- TELEPHONE POLE (TP)
- ELECTRICAL MANHOLE (E)
- ELECTRIC METER (E)
- STORM DRAIN MANHOLE (SD)
- CATCH BASIN / SD INLET (CB)
- SANITARY CLEANOUT (S)
- SANITARY MANHOLE (SS)
- TELEPHONE MANHOLE (T)
- WATER VALVE (WV)
- WATER METER (W)
- BLOWOFF
- GAS VALVE (GV)
- GAS METER (G)
- SPRINKLER (90° 180° 270° 360°)
- PRECAST VAULT (PV)
- TELEMETRY CABLE PULLBOX (T)
- VENTILATION STRUCTURE (V)
- VALVE, SWITCH
- TREE
- TREES (NUMBER DENOTES SIZE & KIND OF TREE SHOWN IN TREE REMOVAL TABLE SHEET D-1) (1 2 3 4 5 6)
- STORM DRAIN OUTFALL
- FIRE HYDRANT
- UTILITIES BOXES
- ELECTROLIER
- FACILITIES
- SLOPE OF BANK (Down)
- SACKED CONCRETE SLOPE PROTECTION
- GABION LINING
- ROCK SLOPE PROTECTION
- GROUTED ROCK LINING
- CONCRETE
- GRAVEL
- AC PAVEMENT
- CONC. BARRIER

EXISTING LINE TYPES / PROPOSED LINE TYPES



	PROPOSED LINE TYPES
CABLE TELEVISION	——CTV——CTV——
ELECTRICAL LINE	——E——E——
ELECTRICAL & TELEPHONE LINE	——E/T——
ELECTRICAL LINE - OVERHEAD	——E(OH)——
TEMPORARY PRESERVATION FENCE	——F——F——
GAS LINE	——G——G——
IRRIGATION LINE	——IR——IR——
STORM DRAIN LINE	——SD——SD——
SANITARY SEWER LINE	——SS——SS——
TELEPHONE LINE	——T——T——
TELEPHONE LINE - OVERHEAD	——T(OH)——
TRAFFIC SIGNAL LINE	——TS——TS——
TELEMETRY LINE	——TC——TC——
WATER LINE	——W——W——
BARBED WIRE FENCE LINE	——x——x——x——
CHAIN LINK FENCE LINE	——●——●——●——
WOODEN FENCE LINE	——//——//——//——
TRAIL LINE	——TR——TR——
CUT OR FILL SLOPE	TOP / TOE
CONTROL LINE	—— – ——℄—— – ——
GROUND	
RW UTILITY EASEMENT	
ROW-FEE	
PROPERTY-LINE	
ROW-TRACT	
ROW-SCVWD-EASEMENT	

MISCELLANEOUS

▽	WATER SURFACE (PROFILE)
✱	CONE PENETROMETER
S=0.0016	SLOPE
∢	ANGLE
&	AND
@	AT
℄	CONTROL LINE OR CENTER LINE
Ŀ	FLOW LINE
%	PERCENT
℘	PROPERTY LINE
ø	ROUND
#	NUMBER
(125)	NUMERICAL POINT DESIGNATION
◐	GEOTECHNICAL BORING LOCATION

SPECIAL ABBREVIATIONS

M³/S	CUBIC METERS PER SECOND
MPA	MEGA PASCALS
F'C	COMPRESSIVE STRENGTH OF CONCRETE

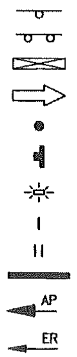
SPECIAL SYMBOLS

●	BOLLARD

SURVEY

△	HORIZONTAL CONTROL
⊙	VERTICAL CONTROL
△	HORIZONTAL VERTICAL CONTROL
△	SURVEY MONUMENT OR HORIZONTAL CONTROL POINT
⊠	BENCH MARK
◎	MONUMENT SET AS NOTED
●	FOUND IRON PIPE AS NOTED
◉	FOUND ST'D. CITY MONUMENT

TRAFFIC CONTROL



- SIGN-1
- SIGN-2
- BUS STOP
- TRAFFIC DIRECTION
- TRAFFIC CONE
- CONSTRUCTION SIGN
- FLASHING ARROW SIGN
- TYPE I - TRAFFIC BARRICADE
- TYPE III - TRAFFIC BARRICADE
- K-RAIL BARRIER (TEMPORARY)
- ACCESS POINT (AP)
- EXIST. RAMP (ER)

DETAIL AND SECTION DESIGNATION

(1 / X-X) INDICATES DETAIL NUMBER
INDICATES SHEET FROM WHICH DETAIL APPEARS

(A / X-X) INDICATES SECTION DESIGNATION
INDICATES SHEETS FROM WHICH SECTION APPEARS

FOR USE WITH CALTRANS STANDARD PLANS DATED JULY, 2004

(BO-1 / X-X) INDICATES STANDARD PLAN SHEET NUMBER
INDICATES SHEET FROM WHICH DETAIL APPEARS

GENERAL ABBREVIATIONS

AB	ANCHOR BOLT (- AGGREGATE BASE)
ABN	ABANDON
ABUT	ABUTMENT
AC	ASPHALT CONCRETE
ACI	AMERICAN CONCRETE INSTITUTE
ACP	ASBESTOS CEMENT PIPE
ALIGN	ALIGNMENT (- ALIGN)
ALT	ALTERNATE (- ALTERNATED)
AMP	AMPERE
AP	ACCESS POINT
APPROX	APPROXIMATE (- APPROXIMATELY)
ASPH	ASPHALT
ASSY	ASSEMBLY
AVE	AVENUE
AVG	AVERAGE
BC	BEGIN CURVE
BF	BOTH FACES
BIT	BITUMINOUS
BK	BANK
BLDG	BUILDING
BM	BENCH MARK
BOT	BOTTOM
BR	BRIDGE
BRG	BEARING
BW	BARBED WIRE
C	CURVE, - CHORD
CB	CATCH BASIN
CCP	CONCRETE CYLINDER PIPE
CFM	CUBIC FEET PER MINUTE
CFS	CUBIC FEET PER SECOND
CIP	CAST IRON PIPE
CJ	CONSTRUCTION JOINT
CLR	CLEAR (- CLEARANCE)
CL-1.8	CHAIN LINK FENCE (NUMBER = HEIGHT)
CM	CENTIMETER
CMP	CORRUGATED METAL PIPE
CMS	CUBIC METERS PER SECOND
COL	COLUMN
CONC	CONCRETE
CONST	CONSTRUCT (CONSTRUCTION)
CONT	CONTINUOUS (- CONTROL)
CRK	CREEK
CY	CUBIC YARDS
CYL	CYLINDER
DBL	DOUBLE
DEG (°)	DEGREES
DI	DROP INLET
DIA	DIAMETER
DIP	DUCTILE IRON PIPE
DR	DRIVE
D/S	DOWNSTREAM
DWG	DRAWING (- DRAWINGS)
DWN	DOWN
DET	DETAIL
E	EAST
EA	EACH
EC	END CURVE
EF	EACH FACE
EG	EXISTING GRADE
EJ	EXPANSION JOINT
ELEC	ELECTRIC (ELECTRICAL)
ELEV	ELEVATION
E'LY	EASTERLY
ENGR	ENGINEER (ENGINEERING)
EP	EDGE OF PAVEMENT
EQU	EQUATION
EW	EACH WAY
EXIST	EXISTING
EXP	EXPANSION
EXPWY	EXPRESSWAY
FB	FREEBOARD
FD	FOUND
FF	FAR FACE
FG	FINISH GRADE
FH	FIRE HYDRANT
FT (')	FEET (- FOOT)
FTG	FOOTING
FWY	FREEWAY
G	GAS
GA	GAUGE (GAGE)
GAL	GALVANIZE (GALVANIZED)
GB	GUY ANCHOR AND POLE
GB	GRADE BREAK
GFI	GROUND FAULT INTERRUPTER
GPM	GALLONS PER MINUTE
GP	GUY POLE
GPS	GALLONS PER SECOND
GR	GRADE
GRD	GROUND
GRP	GROUP
H	HEIGHT
HK	HOOK (APPLIED TO REBAR)
H&T	HUB AND TACK
HOR	HORIZONTAL
HP	HORSEPOWER, HINGEPOINT
HW	HEADWALL
HWY	HIGHWAY
ID	INSIDE DIAMETER (DIMENSION)
IF	INSIDE FACE
IN (")	INCH (INCHES)
INV	INVERT
IP	IRON PIPE
IRRIG	IRRIGATION
JCT	JUNCTION
JP	JOINT POLE
JT	JOINT
L	LENGTH (LONG)
LN	LANE
LT	LEFT
LP	LIP OF GUTTER
MAINT	MAINTENANCE
MATL	MATERIAL(S)
MAX	MAXIMUM
MBR	MEMBER
MFP	MODIFIED FLOOD PLAIN
MH	MANHOLE
MIN	MINIMUM
MON	MONUMENT
MTL	METAL
N	NORTH
NAVD	NORTH AMERICAN VERTICAL DATUM
N/A	NOT APPLICABLE, NOT AVAILABLE
NE	NORTHEAST
NE'LY	NORTHEASTERLY
NF	NEAR FACE
NGVD	NATIONAL GEODETIC VERTICAL DATUM
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE
NW	NORTHWEST
NW'LY	NORTHWESTERLY
N'LY	NORTHERLY
OC	ON CENTER
OD	OUTSIDE DIAMETER (DIMENSION)
OF	OUTSIDE FACE
OG	ORIGINAL GROUND
OH	OVERHEAD
OPNG	OPENING
PB	PULL BOX
PCC	PORTLAND CEMENT CONCRETE POINT OF COMPOUND CURVE
PED	PEDESTRIAN
PI	POINT OF INTERSECTION
POB	POINT OF BEGINING
POT	POINT OF TANGENT
PP	POWER POLE
PRC	POINT OF REVERSE CURVE
PROP	PROPOSED
PSI	POUNDS PER SQUARE INCH
PT	POINT
PVC	POLYVINYL CHLORIDE (PIPE)
PVMT	PAVEMENT
Q	DESIGN DISCHARGE (m^3/s)
R	RADIUS
RCB	REINFORCED CONCRETE BOX
RCP	REINFORCED CONCRETE PIPE
RD	ROAD
REF	REFERENCE (REFER)
REINF	REINFORCEMENT (REINFORCING)
REQ'D	REQUIRED
RP	RADIUS POINT
RT	RIGHT
RTE	ROUTE
RTP	ROCK TOE PROTECTION
RSP	ROCK SLOPE PROTECTION
RR	RAILROAD
R/W	RIGHT OF WAY
RW	RETAINING WALL
RWLOL	RETAINING WALL LAYOUT LINE
S	SOUTH, SLOPE
SCH	SCHEDULE
SCRR	SACK CONCRETE RIP-RAP
SCSP	SACKED CONCRETE SLOPE PROTECTION
SCVWD	SANTA CLARA VALLEY WATER DISTRICT
SD	STORM DRAIN, STANDARD DETAIL
SE	SOUTHEAST
SEC (")	SECONDS
SECT	SECTION
SE'LY	SOUTHEASTERLY
SHT	SHEET
SIM	SIMILAR
SPEC	SPECIFICATIONS
SQ FT	SQUARE FEET
SS	SANITARY SEWER
STA	STATION
STD	STANDARD
STL	STEEL
STR	STRUCTURE
SW	SOUTHWEST
SW'LY	SOUTHWESTERLY
S'LY	SOUTHERLY
SY	SYMMETRICAL
SYM	SQUARE YARDS
TAN	TANGENT
TEL	TELEPHONE
TBD	TO BE DETERMINED
TBM	TEMPORARY BENCH MARK
TC	TOP OF CURB
TCA	TEMPORARY CONSTRUCTION AREA
TOB	TOP OF BANK
TOC	TOE OF CHANNEL
TOCC	TOE OF CONCRETE CHANNEL
TOPCC	TOP OF CONCRETE CHANNEL
TP	TELEPHONE POLE, TURNING POINT
TP-1	TEST PIT (NUMBER=DESIGNATION/LOCATION)
TRFC	TRAFFIC
TS	TRAFFIC SIGNAL
TV	TELEVISION (CABLE OR FACILITY)
TW	TOP OF WALL
TYP	TYPICAL
T&B	TOP AND BOTTOM
UB	UTILITY BOX
UC	UTILITY CONDUIT
UG	UNDERGROUND
U/S	UPSTREAM
USC&GS	UNITED STATES COASTAL AND GEODETIC SURVEY
V	VOLTS
VCP	VITRIFIED CLAY PIPE
VERT	VERTICAL
W	WITH, WATER, WEST, WIDTH, (WIDE)
W/O	WITHOUT
WD	WOOD (WOODEN)
WS	WATER SURFACE
WSP	WATER SURFACE PROFILE
WT	WEIGHT
WV	WATER VALVE
WW	WING WALL
WWF	WELDED WIRE FABRIC
W'LY	WESTERLY
X-SECT	CROSS SECTION
Y	YARDS
Z	ZONE

METRIC UNITS (SI)

°c	DEGREE CELSIUS
L	LITER
mm	MILLIMETER
m	METER, METERS (LENGTH)
m^2	SQUARE METER
m^3	CUBIC METER
m/s	METER PER SECOND
mpa	MEGAPASCAL
s	SECOND (TIME)

REV	DESCRIPTION	DATE	APPR.

REFERENCE INFORMATION AND NOTES

ENGINEER'S REPORT
06-14-07

DATE	06/06/07
DESIGN	C. CHUNG
DRAWN	L.P./M.S.
CHECKED	T. NDAH

ENGINEERING CERTIFICATION
TONY TEGHEN NDAH No. C67634
6/13/07
PROJECT ENGINEER MM-DD-YY

Santa Clara Valley Water District

PROJECT NAME AND SHEET DESCRIPTION:

ADOBE CREEK UPPER REACH 5 RESTORATION PROJECT

ABBREVIATIONS, LEGEND, & SYMBOLS

SCALE: NOT TO SCALE
VERIFY SCALES 0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

PROJECT NUMBER: 10104011
SHEET CODE: G-3
PAGE NUMBER: 3 OF 12

DOCUMENT_NUMBER

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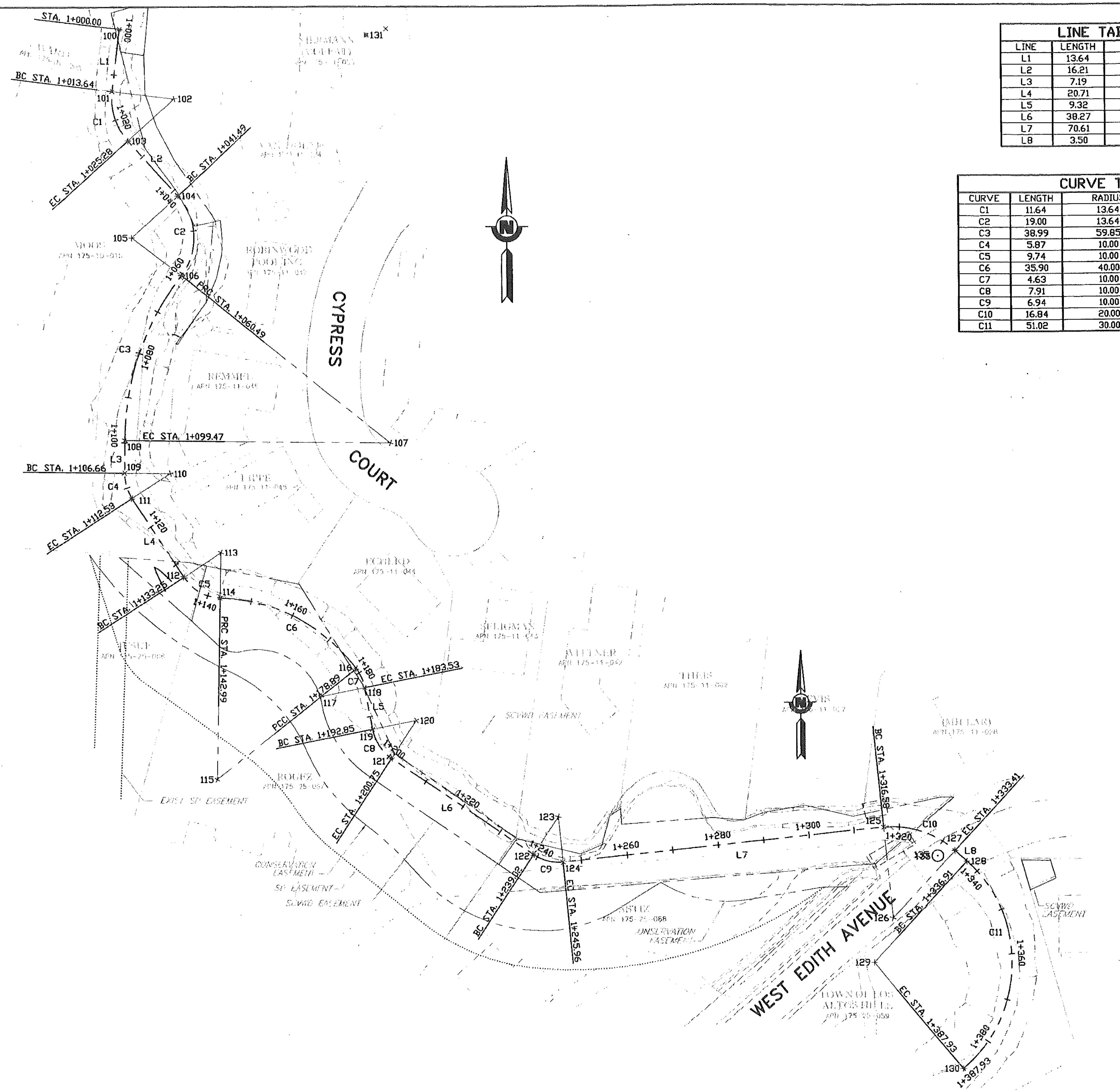

LINE TABLE

LINE	LENGTH	BEARING
L1	13.64	S06°54'24"W
L2	16.21	S41°58'22"E
L3	7.19	S00°35'54"W
L4	20.71	S33°02'02"E
L5	9.32	S10°51'20"E
L6	38.27	S56°09'05"E
L7	70.61	N84°05'54"E
L8	3.50	S47°40'13"E

CURVE TABLE

CURVE	LENGTH	RADIUS	DELTA ANGLE
C1	11.64	13.64	48°52'46"
C2	19.00	13.64	79°47'48"
C3	38.99	59.85	37°19'17"
C4	5.87	10.00	33°37'57"
C5	9.74	10.00	55°48'05"
C6	35.90	40.00	51°25'39"
C7	4.63	10.00	26°33'09"
C8	7.91	10.00	45°17'45"
C9	6.94	10.00	39°45'01"
C10	16.84	20.00	48°13'52"
C11	51.02	30.00	97°26'25"

POINT TABLE

POINT	NORTHING	EASTING	STATION	DESCRIPTION
100	N 599230.3740	E 1856051.2975	1+000.00	BEGIN PROJECT
101	N 599216.8329	E 1856049.6573	1+013.64	BC
102	N 599215.1927	E 1856063.1983	N/A	RP
103	N 599206.0706	E 1856053.0575	1+025.28	EC
104	N 599194.0154	E 1856063.9017	1+041.49	BC
105	N 599184.8973	E 1856053.7655	N/A	RP
106	N 599176.5287	E 1856064.5351	1+060.49	PRC
107	N 599139.7357	E 1856111.8457	N/A	RP
108	N 599140.3613	E 1856051.9324	1+099.47	EC
109	N 599133.1717	E 1856051.8573	1+106.66	BC
110	N 599133.0672	E 1856061.8567	N/A	RP
111	N 599127.6159	E 1856053.4733	1+112.53	EC
112	N 599110.2497	E 1856064.7656	1+133.25	BC
113	N 599115.7010	E 1856073.1491	N/A	RP
114	N 599105.7031	E 1856072.9458	1+142.99	PRC
115	N 599065.7114	E 1856072.1329	N/A	RP
116	N 599090.0108	E 1856103.9061	1+178.89	PCC
117	N 599083.9360	E 1856095.9628	N/A	RP
118	N 599085.8193	E 1856105.7838	1+183.53	EC
119	N 599076.6631	E 1856107.5396	1+192.85	BC
120	N 599078.5464	E 1856117.3607	N/A	RP
121	N 599070.2413	E 1856111.7907	1+200.75	EC
122	N 599048.9249	E 1856143.5743	1+239.02	BC
123	N 599057.2300	E 1856149.1443	N/A	RP
124	N 599047.2830	E 1856150.1725	1+245.96	EC
125	N 599054.5435	E 1856220.4120	1+316.58	BC
126	N 599034.6495	E 1856222.4684	N/A	RP
127	N 599049.4351	E 1856235.9363	1+333.41	EC
128	N 599047.0791	E 1856238.5228	1+336.91	BC
129	N 599024.9006	E 1856218.3210	N/A	RP
130	N 599001.9970	E 1856237.6968	1+387.93	EC/END PROJECT
*131	N 599230.3761	E 1856111.3619	FOUND NAIL & SHINER	
*133	N 599006.2903	E 1856193.7969	FOUND GRANITE MON.	
**134	N 599226.1588	E 1856654.5304	VERT. CNTRL (BM) 288. BD ON TOP OF CURB AT SOUTHWEST CORNER OF LOS ALTOS AVE. AND EDITH AVE.	
135	N 599048.3000	E 1856232.2000	VERT. CNTRL (BM) 520. BRASS DISK ON TOP OF 3 FEET TALL CONCRETE HEADWALL AT THE NORTHEAST SIDE OF EDITH AVE. BRIDGE OVER ADOBE CREEK, 35 METERS SOUTHWEST FROM CYPRESS DR.	

* HORIZONTAL CONTROL POINTS SHOWN FOR REFERENCE ONLY. SPATIAL LOCATION OR REFERENCE NOT ACCURATELY DEPICTED.

** VERTICAL CONTROL (BM) COORDINATE VALUES ARE NOT TO BE USED FOR SURVEY OR DESIGN WORK. THEY ARE MERELY PROVIDED FOR APPROXIMATE LOCATION ONLY.

REV	DESCRIPTION	DATE	APPR.

DOCUMENT_NUMBER

REFERENCE INFORMATION AND NOTES

ENGINEER'S REPORT
06-14-07

DATE	06/06/07
DESIGN	C. CHUNG
DRAWN	L.P./M.S.
CHECKED	T. NDAH

ENGINEERING CERTIFICATION
Exp. 06/30/07
CIVIL
6/13/07
PROJECT ENGINEER MM-DD-YY

Santa Clara Valley Water District

PROJECT NAME AND SHEET DESCRIPTION:

ADOBE CREEK UPPER REACH 5 RESTORATION PROJECT

SURVEY LAYOUT

SCALE
1:500

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

PROJECT NUMBER
10104011

SHEET CODE:
G-4

PAGE NUMBER:
4 OF 12

USERNAME: michsuto Wed 13 Jun 2007 01:20pm
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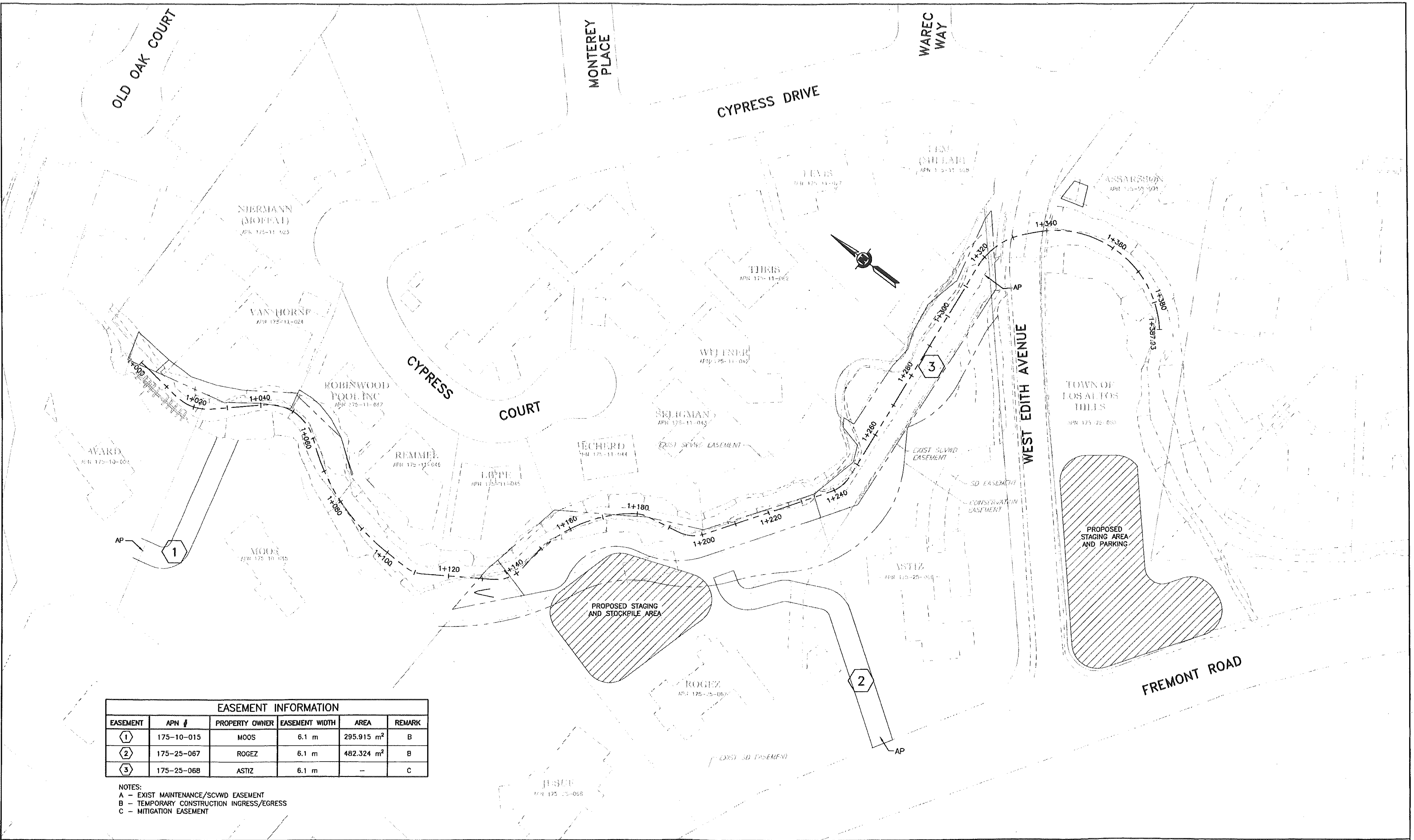

EASEMENT INFORMATION					
EASEMENT	APN #	PROPERTY OWNER	EASEMENT WIDTH	AREA	REMARK
⟨1⟩	175-10-015	MOOS	6.1 m	295.915 m^2	B
⟨2⟩	175-25-067	ROGEZ	6.1 m	482.324 m^2	B
⟨3⟩	175-25-068	ASTIZ	6.1 m	–	C

NOTES:
A – EXIST MAINTENANCE/SCVWD EASEMENT
B – TEMPORARY CONSTRUCTION INGRESS/EGRESS
C – MITIGATION EASEMENT

REV	DESCRIPTION	DATE	APPR.

REFERENCE INFORMATION AND NOTES
1. TREES WITHIN THE STAGING AREA SHALL BE PROTECTED.

ENGINEER'S REPORT
06-14-07

DATE
06/06/07
DESIGN
C. CHUNG
DRAWN
L.P./M.S.
CHECKED
T. NDAH

ENGINEERING CERTIFICATION
TONY TEGHEN NDAH
Exp. 06/30/07
6/13/07
PROJECT ENGINEER MM-DD-YY

Santa Clara Valley Water District

PROJECT NAME AND SHEET DESCRIPTION:

ADOBE CREEK UPPER REACH 5 RESTORATION PROJECT

STAGING AREA AND SITE ACCESS

SCALE
1:500

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

PROJECT NUMBER
10104011

SHEET CODE:
G-5

PAGE NUMBER:
5 OF 12

DOCUMENT_NUMBER

USERNAME: mcnsuto Wed 13 Jun 2007 01:20pm
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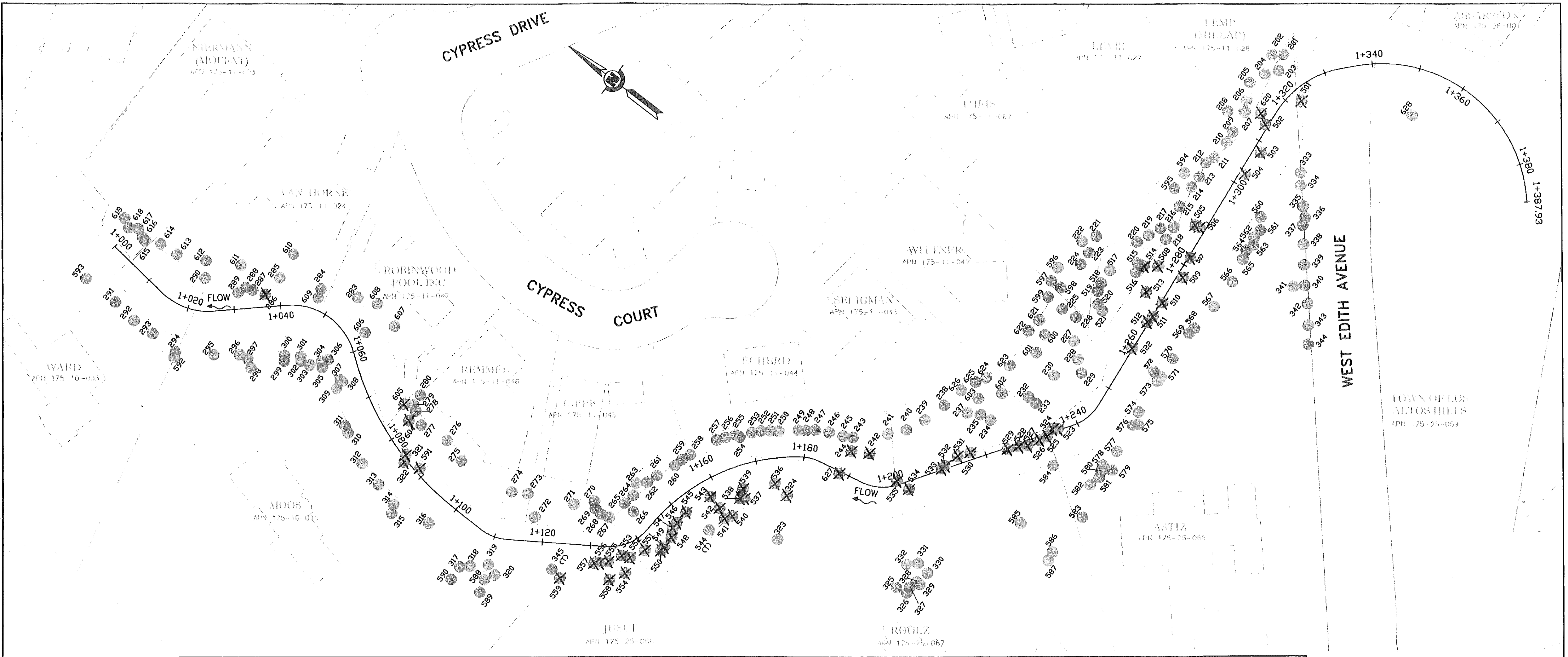

TREE REMOVAL SURVEY CHART

TREE NO.	SURVEY POINT NUMBERS	DESCRIPTION	TREE NO.	SURVEY POINT NUMBERS	DESCRIPTION	TREE NO.	SURVEY POINT NUMBERS	DESCRIPTION	TREE NO.	SURVEY POINT NUMBERS	DESCRIPTION
242	6213	COAST REDWOOD	512	6110	ORIENTAL ARBORVITAE	537	6242	CALIFORNIA BUCHEYE	555	6281	GLOSSY PRIVET
244	6214	COAST REDWOOD	513	6108	BLACKWOOD ACACIA	538	6243	COAST LIVE OAK	556	6280	GLOSSY PRIVET
286	6305	ELDERBERRY	514	6103	BLUE GUM	539	–	CALIFORNIA BAY	557	6279	GLOSSY PRIVET
321	6383	LOMBARDY POPLAR	522	6124	CLACKWOOD ACACIA	540	6247	GLOSSY PRIVET	558	6285	COAST LIVE OAK
322	6382	LOMBARDY POPLAR	523	6178	BLUE GUM	541	6244	GLOSSY PRIVET	559	6277	BLUE GUM
324	6239	COAST REDWOOD	524	6179	BLUE GUM	542	6245	BLUE GUM	591	–	LOMBARDY POPLAR
345	6278	CANARY ISLAND DATE PALM (TRANSPLANT)	525	6198	BLUE GUM	543	6246	COAST LIVE OAK	604	–	CALIFORNIA BUCKEYE
501	6073	NORTHERN CALIFORNIA BLACK WALNUT	526	6197	BLUE GUM	544	6248	CANARY ISLAND DATE PALM (TRANSPLANT)	605	6296	NORTHERN CALIFORNIA BLAK WALNUT
502	6074	BLUE GUM	527	6196	BLUE GUM	545	6250	BLUE GUM	620	–	BLUE GUM
503	6087	BLACKWOOD ACACIA	528	6195	BLUE GUM	546	6251	BLUE GUM	627	–	ELDERBERRY
504	6088	BLACKWOOD ACACIA	529	6180	BLUE GUM	547	6252	RED IRONBARK			
505	6086	COAST REDWOOD	530	6192	BLUE GUM	548	6253	GLOSSY PRIVET			
506	6086*	COAST REDWOOD	531	6191	BLUE GUM	549	6254	RED IRONBARK			
507	6093	BLACKWOOD ACACIA	532	6190	BLUE GUM	550	6255	ELDERBERRY			
508	6102	BLUE GUM	533	6189	BLUE GUM	551	6257	BLUE GUM			
509	6096	ORIENTAL ARBORVITAE	534	6184	BLUE GUM	552	6259	BLUE GUM			
510	6097	ORIENTAL ARBORVITAE	535	6183	NORTHERN CALIFORNIA BLACK WALNUT	553	6283	GLOSSY PRIVET			
511	6109	BLACKWOOD ACACIA	536	6240	CALIFORNIA BAY	554	6284	COAST LIVE OAK			

REV	DESCRIPTION	DATE	APPR.

REFERENCE INFORMATION AND NOTES

ENGINEER'S REPORT
06-14-07

DATE
06/06/07
DESIGN
C. CHUNG
DRAWN
L.P./M.S.
CHECKED
T. NDAH

ENGINEERING CERTIFICATION
TONY TEGHEN NDAH
6/10/07
PROJECT ENGINEER MM-DD-YY

Santa Clara Valley Water District

PROJECT NAME AND SHEET DESCRIPTION:

ADOBE CREEK UPPER REACH 5 RESTORATION PROJECT

DEMOLITION PLAN
TREE REMOVAL

SCALE
1:400

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

PROJECT NUMBER
10104011

SHEET CODE:
D-1

PAGE NUMBER:
6 OF 12

DOCUMENT_NUMBER

USERNAME: michsuto Wed 13 Jun 2007 01:20pm
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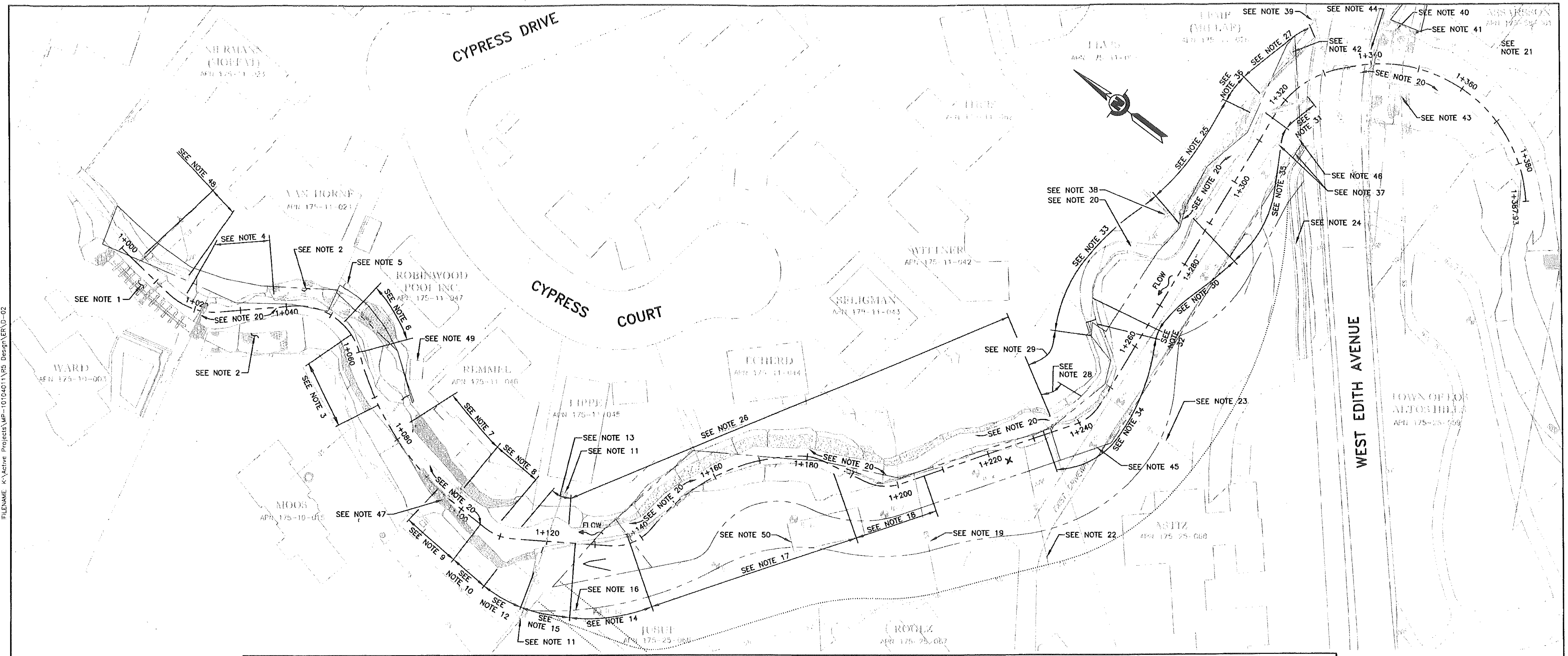

DEMOLITION NOTES

1. EXISTING CRIB WALL TO REMAIN
2. EXISTING SACKED CONCRETE TO REMAIN
3. EXISTING SACKED CONCRETE TO REMAIN
4. EXISTING SACKED CONCRETE TO REMAIN
5. EXISTING SEPTIC TANK TO REMAIN
6. EXISTING SACKED CONCRETE SLOPE PROTECTION TO REMAIN
7. EXISTING GUNITE BANK TO REMAIN
8. EXISTING SACKED CONCRETE TO REMAIN
9. EXISTING ROCK SLOPE PROTECTION TO REMAIN
10. EXISTING SACKED CONCRETE TO REMAIN
11. POWER POLE TO REMAIN PROTECT IN PLACE
12. REMOVE SACKED CONCRETE & A PORTION OF EXIST STORM DRAIN
13. REMOVE 5 m± CHAIN LINK FENCE
14. REMOVE 7 m± WOOD WALL & CONCRETE WALL
15. REMOVE 7 m± CONCRETE WALL
16. ALL 1.5 m STORM DRAINS TO REMAIN EXCEPT FOR FIRST 11 m FROM OUTFALL.
17. REMOVE 40 m± WOOD WALL
18. REMOVE 14 m± WOOD WALL
19. REMOVE STORM DRAIN LATERAL TO R/W AND PLUG
20. CLEAR AND GRUB ENTIRE CHANNEL BOTTOM, THIS INCLUDES REMOVAL OF ALL CONCRETE DEBRIS, EXCEPT THOSE NOTED TO REMAIN. REMOVE ONLY TREES AS NOTED ON SHEET D-1.
21. FENCE TO REMAIN
22. REMOVE 450 mm STORM DRAINS TO R/W AND PLUG END
23. REMOVE 450 mm STORM DRAIN TO R/W AND PLUG END
24. REMOVE 450 mm STORM DRAIN TO R/W AND PLUG END
25. EXISTING BANK TO REMAIN
26. GUNITE BANK TO REMAIN
27. CONCRETE WALL TO REMAIN
28. EXISTING CONCRETE WALL TO REMAIN
29. EXISTING BANK TO REMAIN
30. REMOVE 38 m± CONCRETE WALL
31. REMOVE 10 m± CONCRETE WALL AND 18 m± CHAIN LINK FENCE
32. REMOVE 6 m± SACKED CONCRETE
33. REMOVE 38 m± BRICK WALL TO 1 m BELOW FINISHED GRADE
34. REMOVE 24 m± WOOD WALL
35. REMOVE 28 m± WOOD WALL
36. REMOVE 4 m± WOOD WALL
37. REMOVE BRICK PILASTERS
38. POWER POLE TO REMAIN, PROTECT IN PLACE
39. JOINT POLE TO REMAIN, PROTECT IN PLACE
40. POWER POLE TO REMAIN, PROTECT IN PLACE
41. SANITARY SEWER MANHOLE TO REMAIN
42. STORM DRAIN TO REMAIN
43. EXISTING SEWER WITH CONCRETE CAP TO REMAIN
44. EXISTING TELEPHONE WITH CONCRETE CAP TO REMAIN
45. ABANDON MONITORING WELL B-5
46. SAW CUT AC
47. EXISTING CONCRETE WEIR TO REMAIN
48. REMOVE WOOD WALL
49. EXISTING PUMP HOUSE TO REMAIN
50. ABANDONED POOL TO BE REMOVED

REV	DESCRIPTION	DATE	APPR.

DOCUMENT_NUMBER

REFERENCE INFORMATION AND NOTES

ENGINEER'S REPORT
06-14-07

DATE
06/06/07
DESIGN
C. CHUNG
DRAWN
L.P./M.S.
CHECKED
T. NDAH.

ENGINEERING CERTIFICATION
REGISTERED PROFESSIONAL ENGINEER
TONY TEGHEN NDAH
Exp. 06/30/07
CIVIL
STATE OF CALIFORNIA
6/13/07
PROJECT ENGINEER MM-DD-YY

Santa Clara Valley Water District

PROJECT NAME AND SHEET DESCRIPTION:

ADOBE CREEK UPPER REACH 5 RESTORATION PROJECT

DEMOLITION PLAN
MISCELLANEOUS MATERIAL REMOVAL

SCALE
1:400
VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

PROJECT NUMBER
10104011
SHEET CODE:
D-2
PAGE NUMBER:
7 OF 12

USERNAME: michsuto Wed 13 Jun 2007 01:20pm
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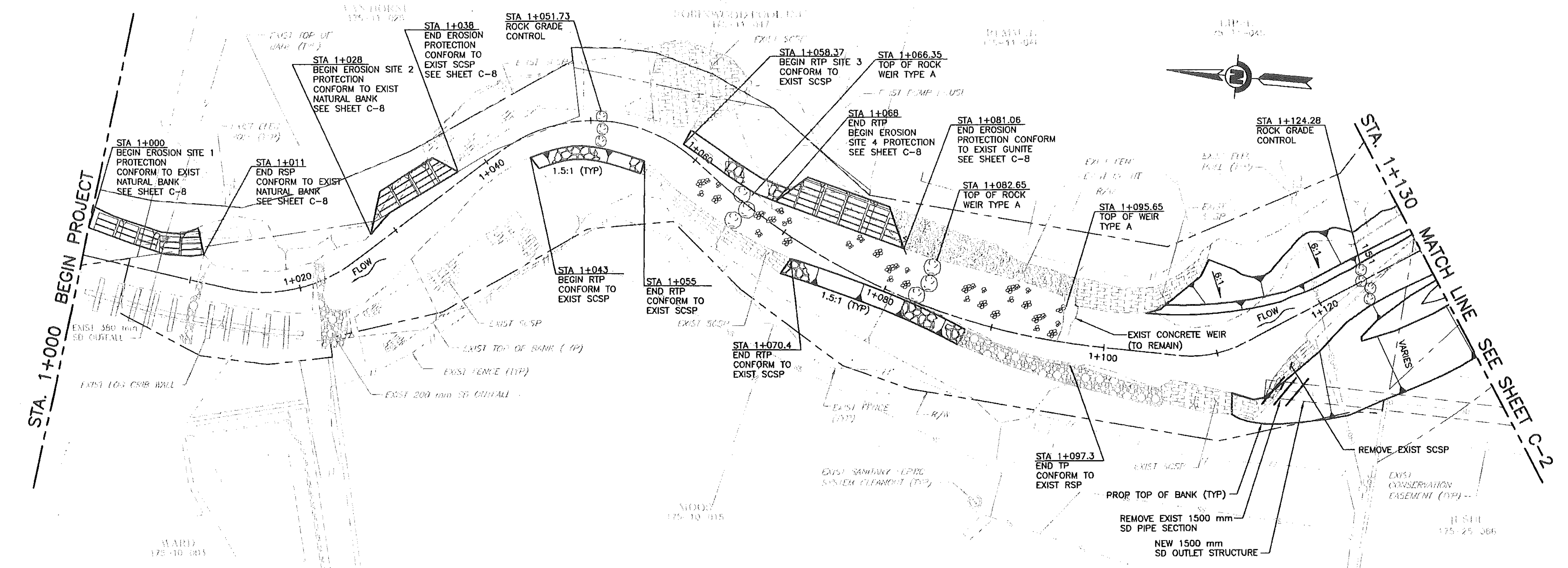
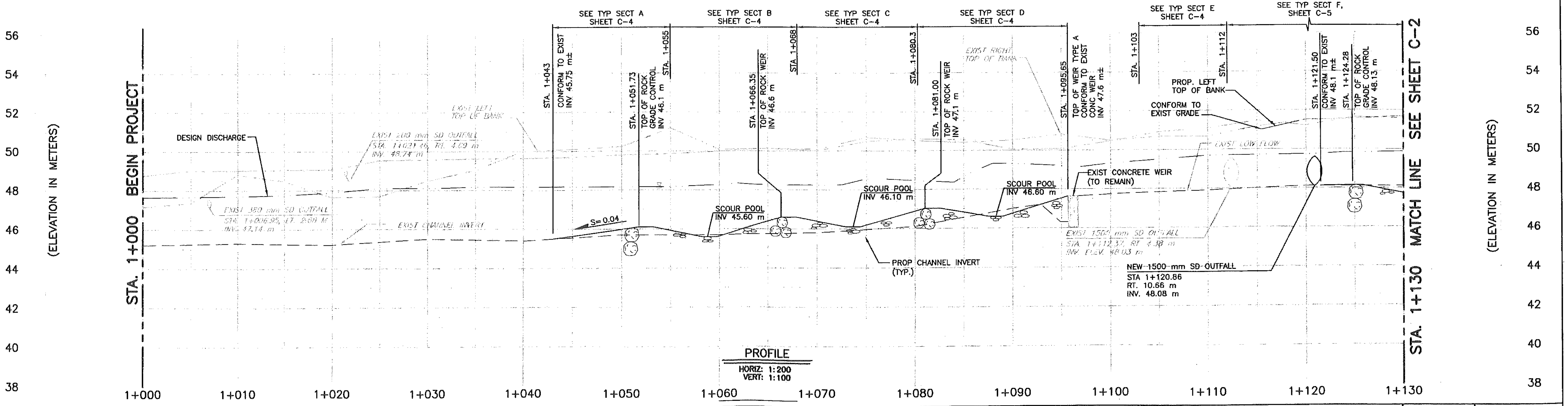


PLAN
PLAN SCALE 1:200



PROFILE
HORIZ: 1:200
VERT: 1:100

DOCUMENT_NUMBER

REV	DESCRIPTION	DATE	APPR.

REFERENCE INFORMATION AND NOTES

1. FOR ROCK WEIR TYPE A DETAILS, SEE SHEET C-6.

ENGINEER'S REPORT
06-14-07

DATE	06/06/07
DESIGN	C. CHUNG
DRAWN	L.P.\M.S.
CHECKED	T. NDAH

ENGINEERING CERTIFICATION

TONY TEGHEN NDAH
Exp. 06/30/07
CIVIL
6/13/07
PROJECT ENGINEER MM-DD-YY

Santa Clara Valley Water District

PROJECT NAME AND SHEET DESCRIPTION:

ADOBE CREEK UPPER REACH 5 RESTORATION PROJECT

PLAN AND PROFILE
STA 1+000 TO STA 1+130

SCALE
AS SHOWN

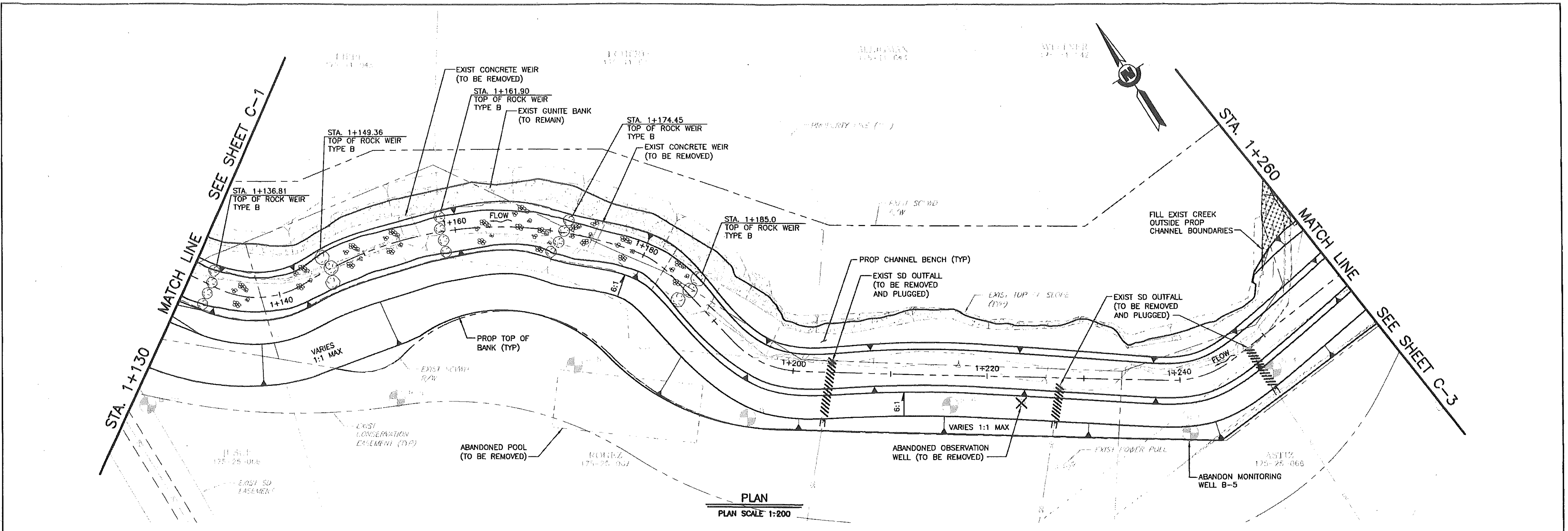
VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

PROJECT NUMBER
10104011

SHEET CODE:
C-1

PAGE NUMBER:
8 OF 12

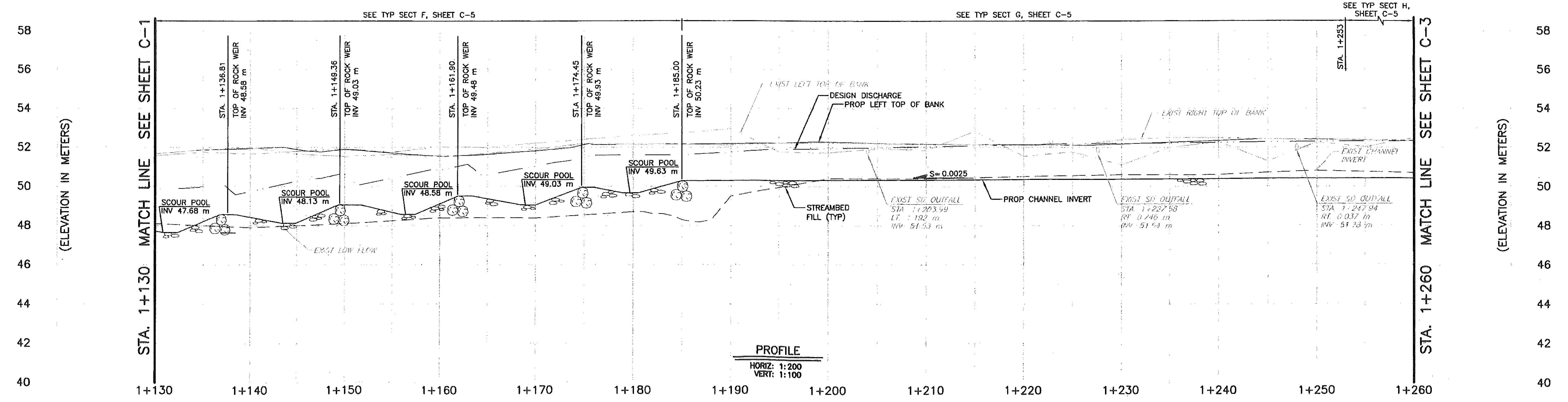
USERNAME: michsuto Wed 13 Jun 2007 01:21pm
FILENAME K:\Active Projects\MP-10104011\R5 Design\ER\C-02



SEE SHEET C-1
MATCH LINE
STA. 1+130
STA. 1+136.81 TOP OF ROCK WEIR TYPE B
STA. 1+149.36 TOP OF ROCK WEIR TYPE B
EXIST CONCRETE WEIR (TO BE REMOVED)
STA. 1+161.90 TOP OF ROCK WEIR TYPE B
EXIST GUNITE BANK (TO REMAIN)
STA. 1+174.45 TOP OF ROCK WEIR TYPE B
EXIST CONCRETE WEIR (TO BE REMOVED)
STA. 1+185.0 TOP OF ROCK WEIR TYPE B
PROP CHANNEL BENCH (TYP)
EXIST SD OUTFALL (TO BE REMOVED AND PLUGGED)
EXIST SD OUTFALL (TO BE REMOVED AND PLUGGED)
EXIST TOP OF SLOPE (TYP)
FILL EXIST CREEK OUTSIDE PROP CHANNEL BOUNDARIES
STA. 1+260
MATCH LINE
SEE SHEET C-3
FLOW
1+140
1+160
1+180
1+200
1+220
1+240
6:1
6:1
VARIES 1:1 MAX
PROP TOP OF BANK (TYP)
VARIES 1:1 MAX
ABANDONED POOL (TO BE REMOVED)
ABANDONED OBSERVATION WELL (TO BE REMOVED)
ABANDON MONITORING WELL B-5
EXIST CONSERVATION EASEMENT (TYP)
EXIST SD EASEMENT
EXIST SCVWD R/W
EXIST POWER POLE
PROPERTY LINE (TYP)
175-25-066

PLAN

PLAN SCALE 1:200



SEE TYP SECT F, SHEET C-5
SEE TYP SECT G, SHEET C-5
SEE TYP SECT H, SHEET C-5
STA. 1+130 MATCH LINE SEE SHEET C-1
STA. 1+260 MATCH LINE SEE SHEET C-3
(ELEVATION IN METERS)
58
56
54
52
50
48
46
44
42
40
STA. 1+136.81 TOP OF ROCK WEIR INV 48.58 m
STA. 1+149.36 TOP OF ROCK WEIR INV 49.03 m
STA. 1+161.90 TOP OF ROCK WEIR INV 49.48 m
STA. 1+174.45 TOP OF ROCK WEIR INV 49.93 m
STA. 1+185.00 TOP OF ROCK WEIR INV 50.23 m
STA. 1+253
SCOUR POOL INV 47.68 m
SCOUR POOL INV 48.13 m
SCOUR POOL INV 48.58 m
SCOUR POOL INV 49.03 m
SCOUR POOL INV 49.63 m
EXIST LEFT TOP OF BANK
DESIGN DISCHARGE
PROP LEFT TOP OF BANK
EXIST RIGHT TOP OF BANK
EXIST CHANNEL INVERT
S= 0.0025
PROP CHANNEL INVERT
STREAMBED FILL (TYP)
EXIST LOW FLOW
EXIST SD OUTFALL STA. 1+203.99 LT. 1.192 m INV. 51.53 m
EXIST SD OUTFALL STA. 1+227.98 RT. 0.746 m INV. 51.54 m
EXIST SD OUTFALL STA. 1+247.94 RT. 0.037 m INV. 51.73 m
1+130
1+140
1+150
1+160
1+170
1+180
1+190
1+200
1+210
1+220
1+230
1+240
1+250
1+260

PROFILE

HORIZ: 1:200
VERT: 1:100

REV	DESCRIPTION	DATE	APPR.

DOCUMENT_NUMBER

REFERENCE INFORMATION AND NOTES

1. FOR ROCK WEIR TYPE B DETAILS, SEE SHEET C-6.

ENGINEER'S REPORT
06-14-07

DATE
06/06/07
DESIGN
C. CHUNG
DRAWN
L.P./M.S.
CHECKED
T. NDAH

ENGINEERING CERTIFICATION

TONY TEGHEN NDAH
No. C67834
Exp. 06/30/07

6/12/07

PROJECT ENGINEER MM-DD-YY

Santa Clara Valley Water District

PROJECT NAME AND SHEET DESCRIPTION:

ADOBE CREEK UPPER REACH 5 RESTORATION PROJECT

PLAN AND PROFILE
STATION 1+130 TO STATION 1+260

SCALE
AS SHOWN

VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

PROJECT NUMBER
10104011

SHEET CODE:
C-2

PAGE NUMBER:
9 OF 12

USERNAME: michsuto Wed 13 Jun 2007 01:21pm
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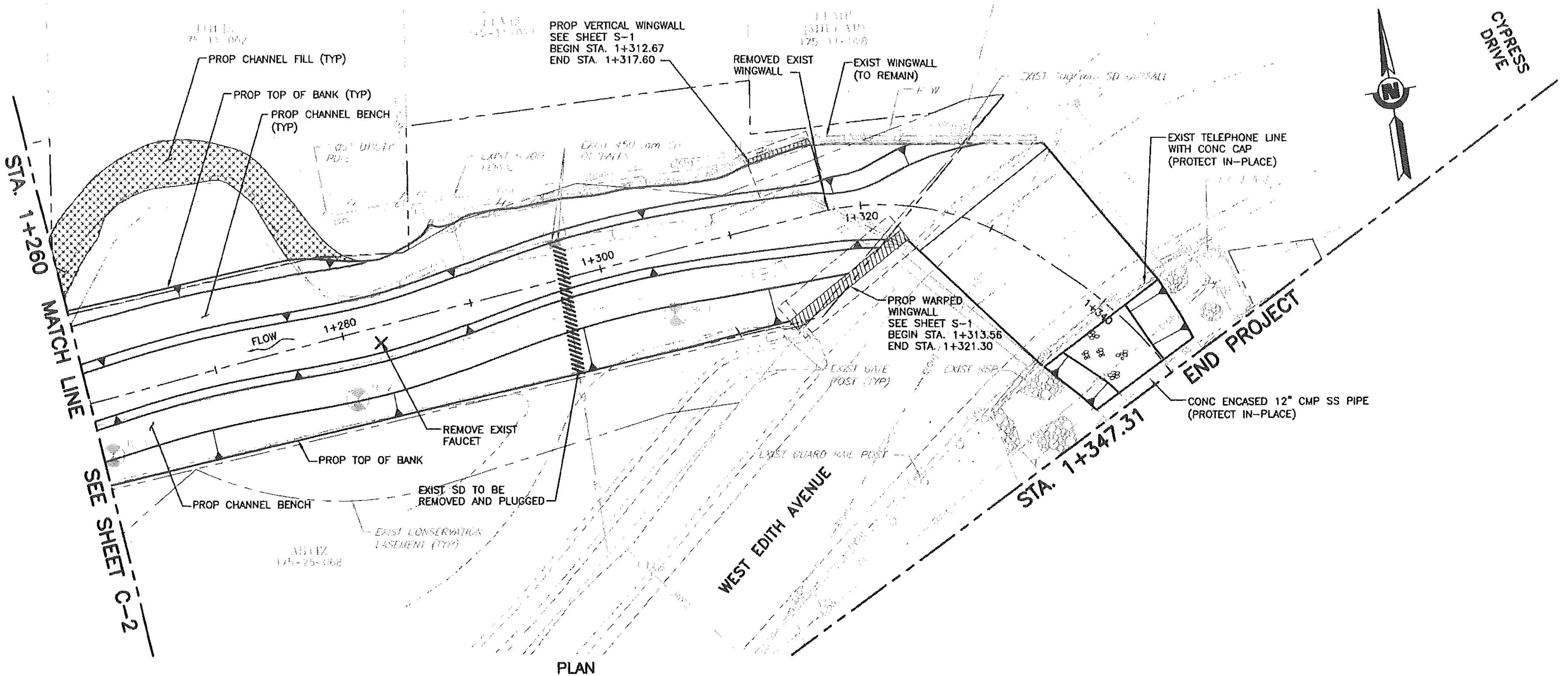
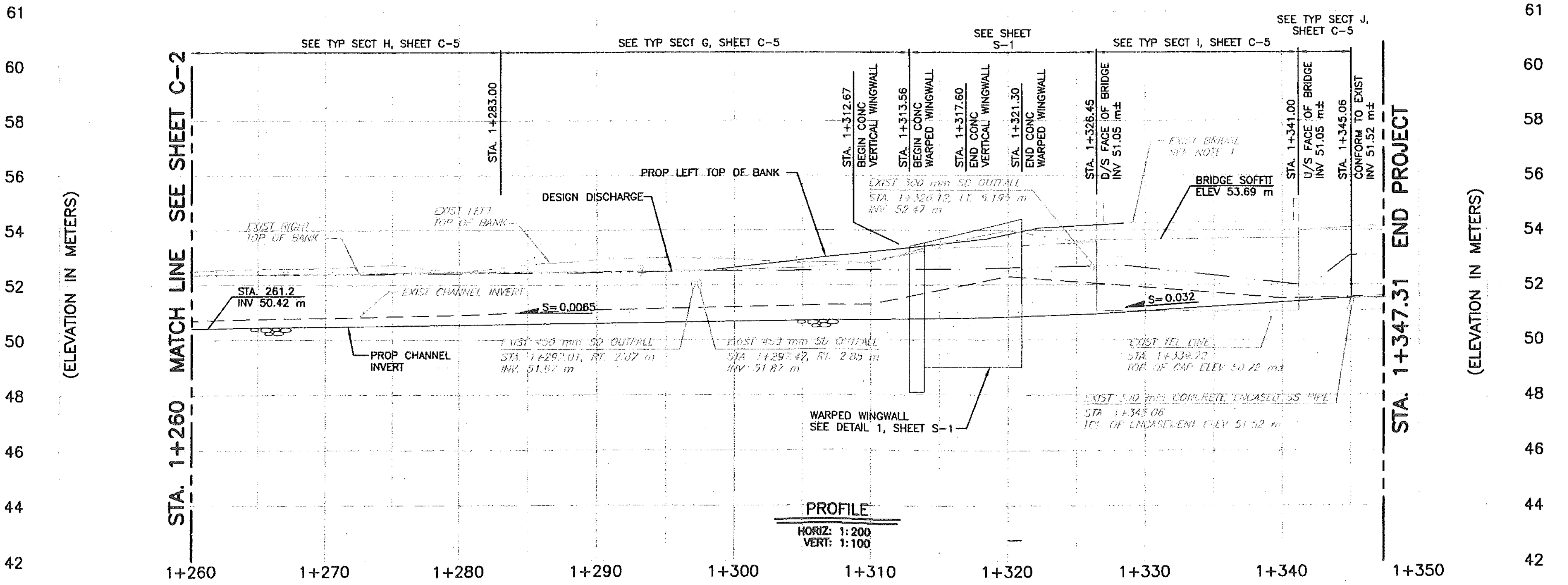


PROP CHANNEL FILL (TYP)
PROP TOP OF BANK (TYP)
PROP CHANNEL BENCH (TYP)
PROP VERTICAL WINGWALL SEE SHEET S-1 BEGIN STA. 1+312.67 END STA. 1+317.60
REMOVED EXIST WINGWALL
EXIST WINGWALL (TO REMAIN)
EXIST TELEPHONE LINE WITH CONC CAP (PROTECT IN-PLACE)
CYPRESS DRIVE
N
STA. 1+260 MATCH LINE SEE SHEET C-2
1+280
1+300
1+320
FLOW
PROP WARPED WINGWALL SEE SHEET S-1 BEGIN STA. 1+313.56 END STA. 1+321.30
END PROJECT
CONC ENCASED 12" CMP SS PIPE (PROTECT IN-PLACE)
STA. 1+347.31
REMOVE EXIST FAUCET
PROP TOP OF BANK
EXIST SD TO BE REMOVED AND PLUGGED
PROP CHANNEL BENCH
EXIST CONSERVATION EASEMENT (TYP)
EXIST GUARD RAIL POST
EXIST GATE POST (TYP)
WEST EDITH AVENUE

PLAN
PLAN SCALE 1:200



61
60
58
56
54
52
50
48
46
44
42
(ELEVATION IN METERS)
STA. 1+260 MATCH LINE SEE SHEET C-2
SEE TYP SECT H, SHEET C-5
SEE TYP SECT G, SHEET C-5
SEE SHEET S-1
SEE TYP SECT I, SHEET C-5
SEE TYP SECT J, SHEET C-5
STA. 1+283.00
STA. 1+312.67 BEGIN CONC VERTICAL WINGWALL
STA. 1+313.56 BEGIN CONC WARPED WINGWALL
STA. 1+317.60 END CONC VERTICAL WINGWALL
STA. 1+321.30 END CONC WARPED WINGWALL
STA. 1+326.45 D/S FACE OF BRIDGE INV 51.05 m±
STA. 1+341.00 U/S FACE OF BRIDGE INV 51.05 m±
STA. 1+345.06 CONFORM TO EXIST INV 51.52 m±
STA. 1+347.31 END PROJECT
PROP LEFT TOP OF BANK
DESIGN DISCHARGE
EXIST RIGHT TOP OF BANK
EXIST LEFT TOP OF BANK
EXIST 300 mm SD OUTFALL STA. 1+320.12, LT. 5.195 m INV. 52.47 m
BRIDGE SOFFIT ELEV 53.69 m
STA. 261.2 INV 50.42 m
EXIST CHANNEL INVERT
S=0.0065
S=0.032
PROP CHANNEL INVERT
EXIST 450 mm SD OUTFALL STA. 1+292.01, RT. 2.87 m INV. 51.87 m
EXIST 450 mm SD OUTFALL STA. 1+297.47, RT. 2.85 m INV. 51.87 m
EXIST TEL CONC STA. 1+339.72 TOP OF CAP ELEV 50.72 m
EXIST 310 mm CONCRETE ENCASED SS PIPE STA. 1+345.06 TOP OF ENCASEMENT ELEV 51.52 m
WARPED WINGWALL SEE DETAIL 1, SHEET S-1
1+260
1+270
1+280
1+290
1+300
1+310
1+320
1+330
1+340
1+350

PROFILE
HORIZ: 1:200
VERT: 1:100

REV	DESCRIPTION	DATE	APPR.

REFERENCE INFORMATION AND NOTES

1. LOCATION AND ELEVATION OF BRIDGE STRUCTURES ARE APPROXIMATE AND FOR REFERENCE ONLY.

ENGINEER'S REPORT
06-14-07

DATE	06/06/07
DESIGN	C. CHUNG
DRAWN	L.P./M.S.
CHECKED	T. NDAH

ENGINEERING CERTIFICATION

TONY TEGHEN NDAH
No. C67634
Exp. 06/30/07

6/13/07

PROJECT ENGINEER MM-DD-YY

Santa Clara Valley Water District

PROJECT NAME AND SHEET DESCRIPTION:

ADOBE CREEK UPPER REACH 5 RESTORATION PROJECT

PLAN AND PROFILE
STA 1+260 TO STA 1+347.31

SCALE	AS SHOWN
VERIFY SCALES	0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY	
PROJECT NUMBER	10104011
SHEET CODE:	C-3
PAGE NUMBER:	10 OF 12

DOCUMENT_NUMBER

USERNAME: michsuto Wed 13 Jun 2007 01:21pm
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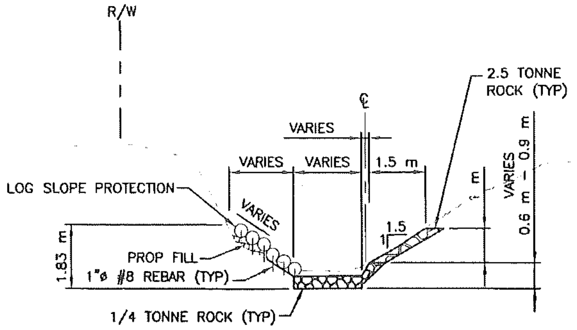
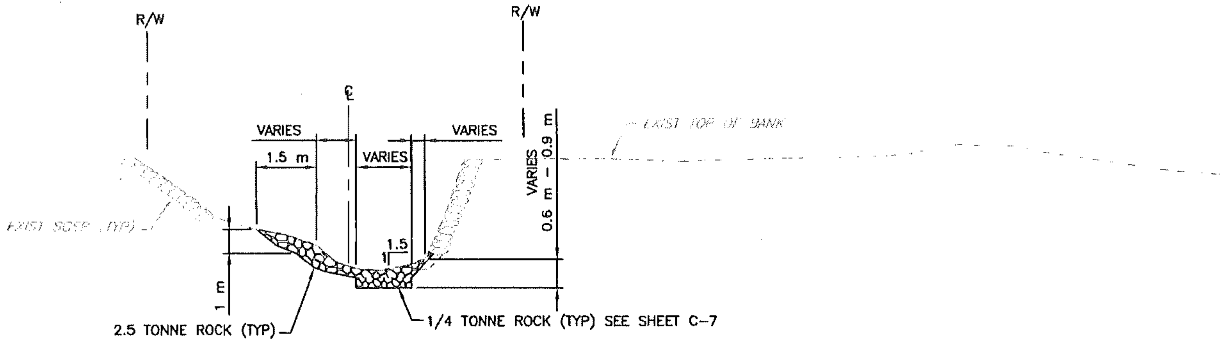


TYPICAL SECTION (C / C-1) STA. 1+068 TO STA. 1+080.3

NTS



TYPICAL SECTION (B / C-1) STA. 1+055 TO STA. 1+068

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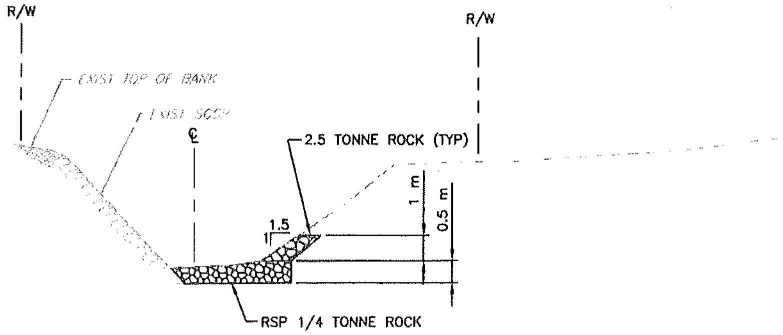

TYPICAL SECTION (A / C-1) STA. 1+043 TO STA. 1+055

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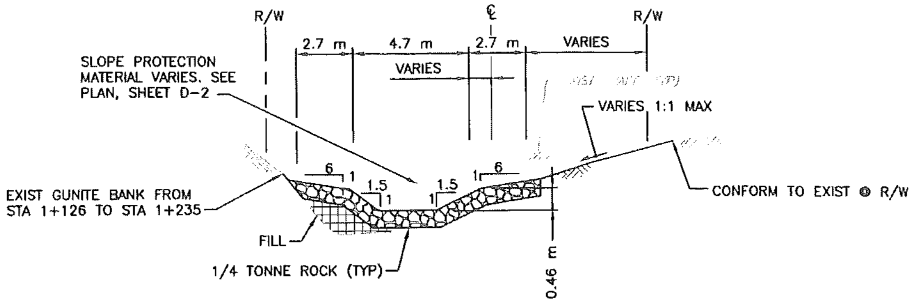
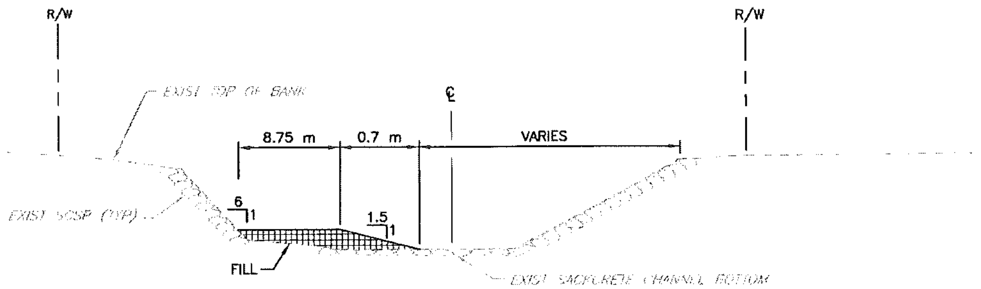


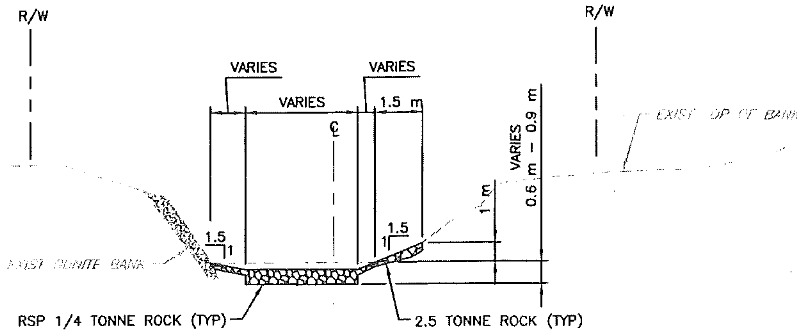
TYPICAL SECTION (F / C-2) STA. 1+112 TO STA. 1+185

NTS



TYPICAL SECTION (E / C-1) STA. 1+103 TO STA. 1+112

NTS



TYPICAL SECTION (D / C-1) STA. 1+080.3 TO STA. 1+095.65

NTS

ALL SECTIONS LOOKING UPSTREAM

REV	DESCRIPTION	DATE	APPR.	REFERENCE INFORMATION AND NOTES
				ENGINEER'S REPORT 06-14-07

DOCUMENT_NUMBER

DATE
06-06-07
DESIGN
C. CHUNG
DRAWN
L.P./M.S.
CHECKED
T. NDAH

ENGINEERING CERTIFICATION
TONY TEGHEN NDAH
No. C67634
6/13/07
PROJECT ENGINEER MM-DD-YY

Santa Clara Valley Water District

PROJECT NAME AND SHEET DESCRIPTION:

ADOBE CREEK UPPER REACH 5 RESTORATION PROJECT

TYPICAL CHANNEL SECTIONS

SCALE
NTS
VERIFY SCALES
0 25
BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY

PROJECT NUMBER
10104011
SHEET CODE:
C-4
PAGE NUMBER:
11 OF 12

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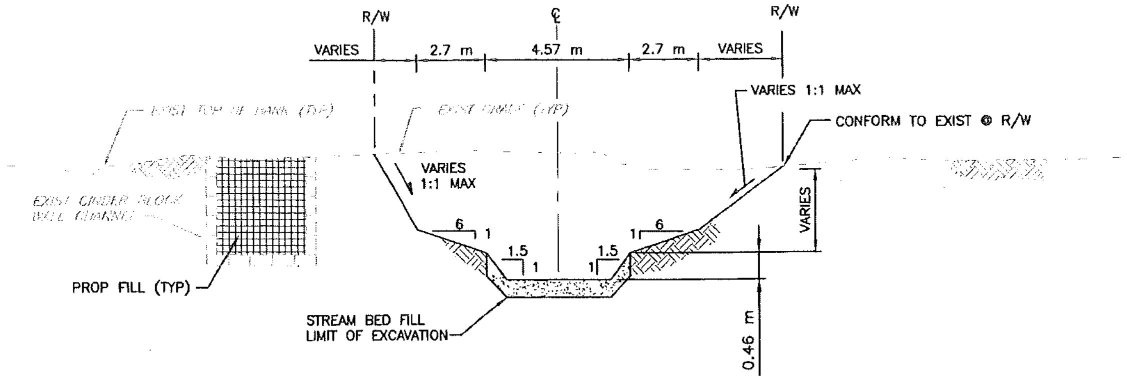
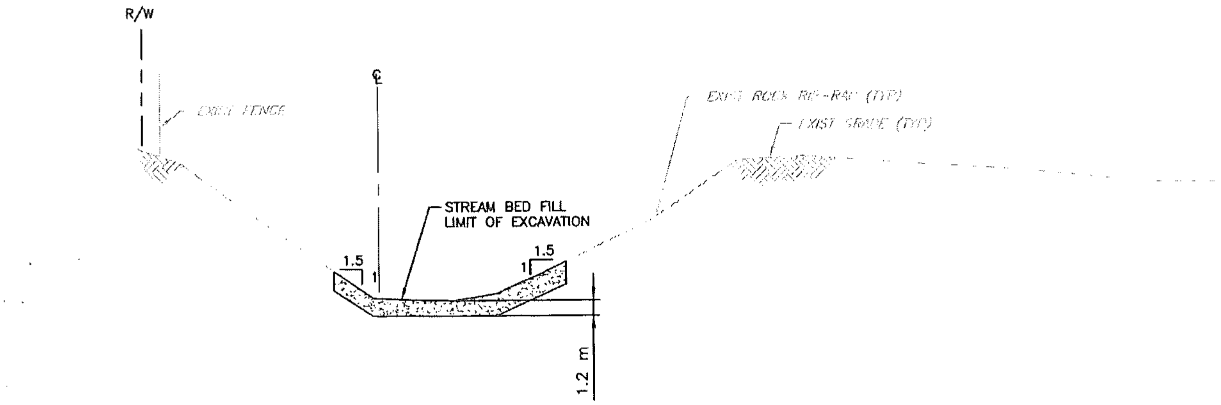
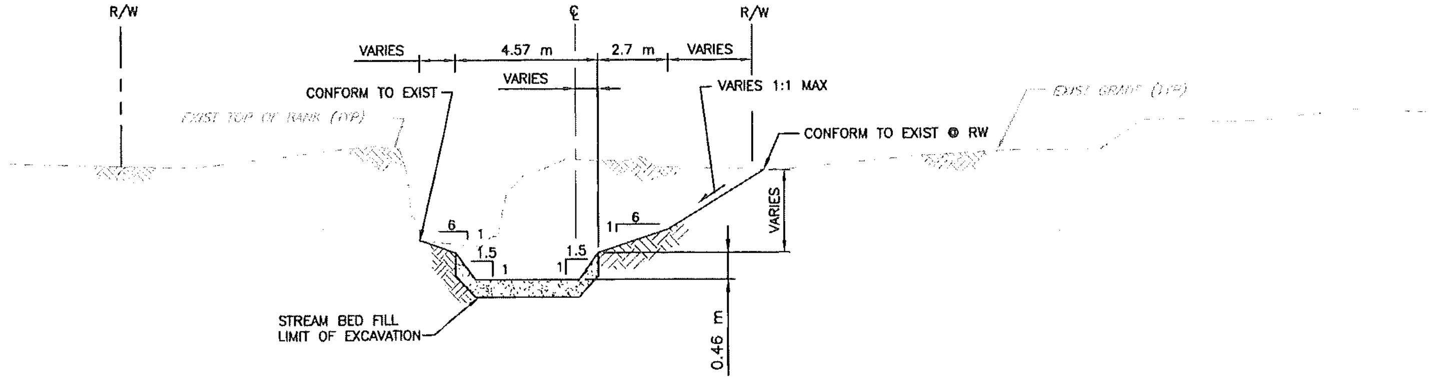


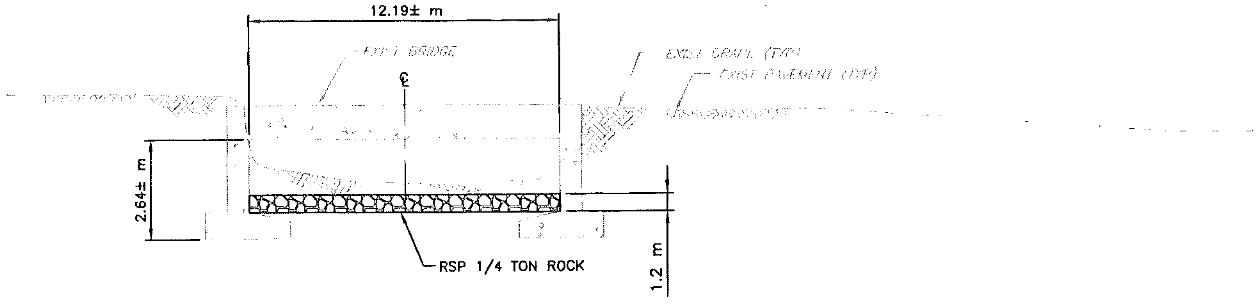
TYPICAL SECTION (H / C-2, C-3) **STA. 1+253 TO STA. 1+283**
NTS



TYPICAL SECTION (J / C-3) **STA. 1+341 TO STA. 1+345.06**
NTS



TYPICAL SECTION (G / C-2, C-3) **STA. 1+185 TO STA. 1+253**
STA. 1+283 TO STA. 1+313.56
NTS



NOTE: PAC BELL CONDUIT & CONCRETE ENCASEMENT
NOT SHOWN

TYPICAL SECTION (I / C-3) **STA. 1+326.45 TO STA. 1+341**
NTS

ALL SECTIONS LOOKING UPSTREAM

REV	DESCRIPTION	DATE	APPR.	REFERENCE INFORMATION AND NOTES	DATE	ENGINEERING CERTIFICATION
				ENGINEER'S REPORT 06-14-07	06-06-07	No. C67834 Exp. 06/30/07 TONY TEGHEN NDAH
					DESIGN C. CHUNG	
					DRAWN L.P./M.S.	6/13/07
					CHECKED T. NDAH	PROJECT ENGINEER MM-DD-YY

DOCUMENT_NUMBER

Santa Clara Valley Water District

PROJECT NAME AND SHEET DESCRIPTION:

ADOBE CREEK UPPER REACH 5 RESTORATION PROJECT

TYPICAL CHANNEL SECTIONS

SCALE	PROJECT NUMBER
NTS	10104011
VERIFY SCALES 0 25 BAR IS 25 MILLIMETERS ON ORIGINAL DRAWING IF NOT ADJUST SCALES ACCORDINGLY	SHEET CODE: C-5
	PAGE NUMBER: 12 OF 12